



# RADIO TEST REPORT

Test Report No. : 30LE0092-HO-01-A-R2

**Applicant** : DENSO WAVE INCORPORATED  
**Type of Equipment** : Bluetooth Board  
**Model No.** : DWBT009  
**FCC ID** : PZWDWBT009  
**Test regulation** : FCC Part 15 Subpart C: 2012  
**Test Result** : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This report is a revised version of 30LE0092-HO-01-A-R1.  
30LE0092-HO-01-A-R1 is replaced with this report.

**Date of test:** November 10 to 14, 2011

**Representative test engineer:**

H. Kukita

Hiroshi Kukita  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**

M. Nishiyama

Masanori Nishiyama  
Manager of WiSE Japan,  
UL Verification Service



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.  
\*As for the range of Accreditation in NVLAP, you may refer to the WEB address,  
<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

**UL Japan, Inc.**

**Head Office EMC Lab.**

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13-EM-F0429

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## **SECTION 1: Customer information**

Company Name : DENSO WAVE INCORPORATED  
Address : 1 Yoshiike, Kusagi, Agui-cho, Chita-gun, Aichi 470-2297 Japan  
Telephone Number : +81-569-49-5354  
Facsimile Number : +81-569-49-5488  
Contact Person : Yoshihide Terauchi

## **SECTION 2: Equipment under test (E.U.T.)**

### **2.1 Identification of E.U.T.**

Type of Equipment : Bluetooth Board  
Model No. : DWBT009  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 3.3V  
Receipt Date of Sample : November 9, 2011  
Country of Mass-production : Japan  
Condition of EUT : Production model  
Modification of EUT : No Modification by the test lab

### **2.2 Product Description**

#### **General Specification**

Clock frequency(ies) in the system : 16MHz

#### **Radio Specification**

##### **[Bluetooth (Ver. 2.0 with EDR function)]**

Radio Type : Transceiver  
Frequency of Operation : 2402-2480MHz  
Modulation : FHSS  
Power Supply (radio part input) : DC 3.0 - 3.6V  
Antenna type : Stacked antenna inverted-F antenna  
Antenna Gain : 2.02dBi  
Operating Temperature : 0 to 40 deg. C

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2012, final revised on August 13, 2012 and effective September 12, 2012

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928MHz,  
2400-2483.5MHz, and 5725-5850MHz

\* The revision on August 13, 2012 does not affect the test specification applied to the EUT.

\* The EUT complies with FCC Part 15 Subpart B: 2012, final revised on August 13, 2012 and effective September 12, 2012

### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.4:2003 7. AC powerline conducted emission measurements IC: RSS-Gen 7.2.4	FCC: Section 15.207 IC: RSS-Gen 7.2.4	[QP] 22.6dB, 0.60336MHz, L [AV] 16.4dB, 0.60336MHz, L	Complied	-
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-210 A8.1 (b)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-210 A8.1 (a)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-210 A8.1 (d)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-210 A8.1 (d)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 4.8	FCC: Section15.247(a)(b)(1) IC: RSS-210 A8.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 4.9	FCC: Section15.247(d) IC: RSS-210 A8.5 RSS-Gen 6 and 7.2.3		2.4dB 364.486MHz, QP, Vertical	Complied

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

\* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

#### **FCC 15.31 (e)**

The RF Module has its own regulator.

The RF Module is constantly provided voltage (DC 3.0 - 3.6V) through its own regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

#### **FCC Part 15.203/212 Antenna requirement**

It is impossible for end users to replace the antenna, because it is soldered on the circuit board. Therefore the equipment complies with the requirement of 15.203/212.

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### 3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 4.6.1	IC: RSS-Gen 4.6.1	N/A	-	Conducted

Other than above, no addition, exclusion nor deviation has been made from the standard.

### 3.4 Uncertainty

#### EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test room (semi-anechoic chamber)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.6dB
No.3	3.6dB
No.4	3.6dB

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.2dB	5.0dB	5.1dB	5.6dB	5.9dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	5.7dB	5.8dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	5.7dB	5.8dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	5.7dB	5.8dB	5.1dB	4.2dB

\*3m/1m/0.5m = Measurement distance

Power meter (+dB)	
Below 1GHz	Above 1GHz
1.0dB	1.0dB

Antenna terminal conducted emission and Power density (+dB)			Antenna terminal conducted emission (+dB)		Channel power (±dB)
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.0dB	1.1dB	2.7dB	3.2dB	3.3dB	1.5dB

#### Conducted Emission test

The data listed in this test report has enough margin, more than the site margin.

#### Radiated emission test(3m)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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### 3.5 Test Location

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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

## **SECTION 4: Operation of E.U.T. during testing**

### **4.1 Operating Mode(s)**

Bluetooth (BT): Transmitting (Tx), Payload: PRBS9  
Inquiry

Details of Operating Mode(s)

<b>Test Item</b>	<b>Mode</b>	<b>Tested frequency</b>
Conducted Emission, Spurious Emission (Conducted/Radiated)	Tx (Hopping off) DH5, 3DH5	2402MHz 2441MHz 2480MHz
Carrier Frequency Separation, 20dB Bandwidth	Tx (Hopping on) DH5, 3DH5 Inquiry	2402MHz 2441MHz 2480MHz
Number of Hopping Frequency	Tx (Hopping on) DH5, 3DH5 Inquiry	-
Dwell time	Tx (Hopping on), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5 Inquiry	-
Maximum Peak Output Power	Tx (Hopping off) DH5, 3DH5 Inquiry	2402MHz 2441MHz 2480MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping on -Hopping off	2402MHz 2480MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping on -Hopping off	2402MHz 2441MHz 2480MHz
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)  *EUT has the power settings by the software as follows;  Power settings: Same as production model  Software: Flash Writer -HC56- Version: 3.07  *Any conditions under the normal use do not exceed the condition of setting.  In addition, end users cannot change the settings of the output power of the product.</p>		

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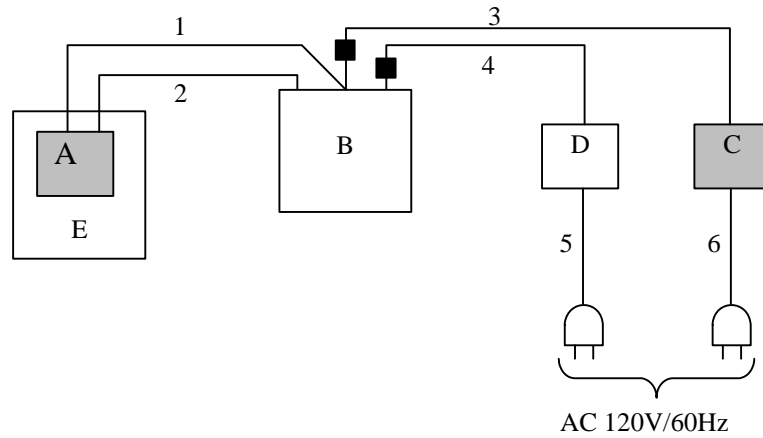
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## 4.2 Configuration and peripherals



■ : Standard Ferrite Core

\* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

### Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Bluetooth Board	DWBT009	4549200080101300 *1)	DENSO WAVE INCORPORATED	EUT
			4549200080101301 *2)		
B	Laptop PC	2366LJ7	9799D4Z	IBM	-
C	AC Adapter	AWW0515NE	001	DENSO WAVE INCORPORATED	EUT
D	AC Adapter	92P1020	11S92P1020Z1Z9RM67F 5CV	IBM	-
E	Bluetooth Adapter	BA11-RKU	4549200080101300 *1)	DENSO WAVE INCORPORATED	-
			4549200080101301 *2)		

\*1) Used for Conducted Emission test and Radiated Emission test

\*2) Used for Antenna Terminal conducted test

### List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	RS-232C Cable	2.0	Shielded	Shielded	-
2	USB Cable	1.5	Shielded	Shielded	-
3	DC Cable	1.2	Unshielded	Unshielded	-
4	DC Cable	1.8	Unshielded	Unshielded	-
5	AC Cable	0.9	Unshielded	Unshielded	-
6	AC Cable	1.9	Unshielded	Unshielded	-

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## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

#### For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber .

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

**Detector** : QP and AV  
**Measurement range** : 0.15-30MHz  
**Test data** : APPENDIX  
**Test result** : Pass

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## **SECTION 6: Radiated Spurious Emission**

### **Test Procedure**

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

### **Test Antennas are used as below;**

Frequency	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

In any 100kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

### **20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5 (IC) and outside the restricted band of FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).**

Frequency	Below 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz or RBW: 1MHz VBW: 270Hz *1)	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz), 1m*2) (above 10GHz)		3m (below 10GHz), 1m*2) (above 10GHz)

\*1) Used for the band edge of the carrier and the harmonics that can be measured. The VBW is based on the inverse of the duty cycle (see Appendix). 270Hz was used for DH5 and 3DH5.

\*2) Distance Factor:  $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

**Measurement range** : 30M-25GHz  
**Test data** : APPENDIX  
**Test result** : Pass

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## **SECTION 7: Antenna Terminal Conducted Tests**

### **Test Procedure**

The tests were made with below setting connected to the antenna port.

<b>Test</b>	<b>Span</b>	<b>RBW</b>	<b>VBW</b>	<b>Sweep time</b>	<b>Detector</b>	<b>Trace</b>	<b>Instrument used</b>
20dB Bandwidth	3MHz	30kHz	100kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30MHz	300kHz	1MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100kHz, 1MHz	300kHz, 3MHz	As necessary capture the entire dwell time per hopping channel	Peak	Max Hold	Spectrum Analyzer
Conducted Spurious Emission *1)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				
	30MHz to 25GHz (Less or equal to 5GHz)	100kHz	300kHz				
Conducted Spurious Emission Band Edge compliance	20MHz	300kHz	1MHz	Auto	Peak	Max Hold	Spectrum Analyzer

\*1) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz)

The test results and limit are rounded off to two decimals place, so some differences might be observed.

**Test data** : APPENDIX  
**Test result** : Pass

**APPENDIX 1: Data of EMI test**

**Conducted Emission**

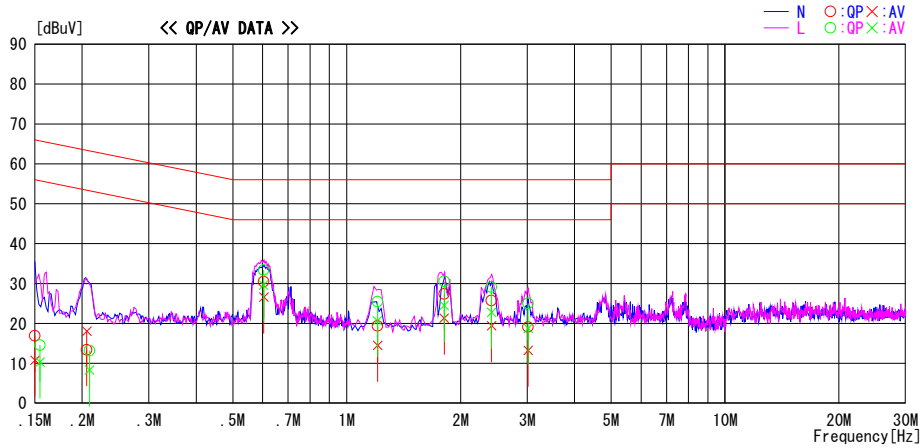
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2011/11/14

Report No. : 30LE0092-HO  
Power : AC 120V / 60Hz  
Temp./Humi. : 20deg. C / 48% RH  
Engineer : Hiroshi Kukita

Mode / Remarks : BT Tx DH5 2441MHz

LIMIT : FCC15.207 QP  
FCC15.207 AV

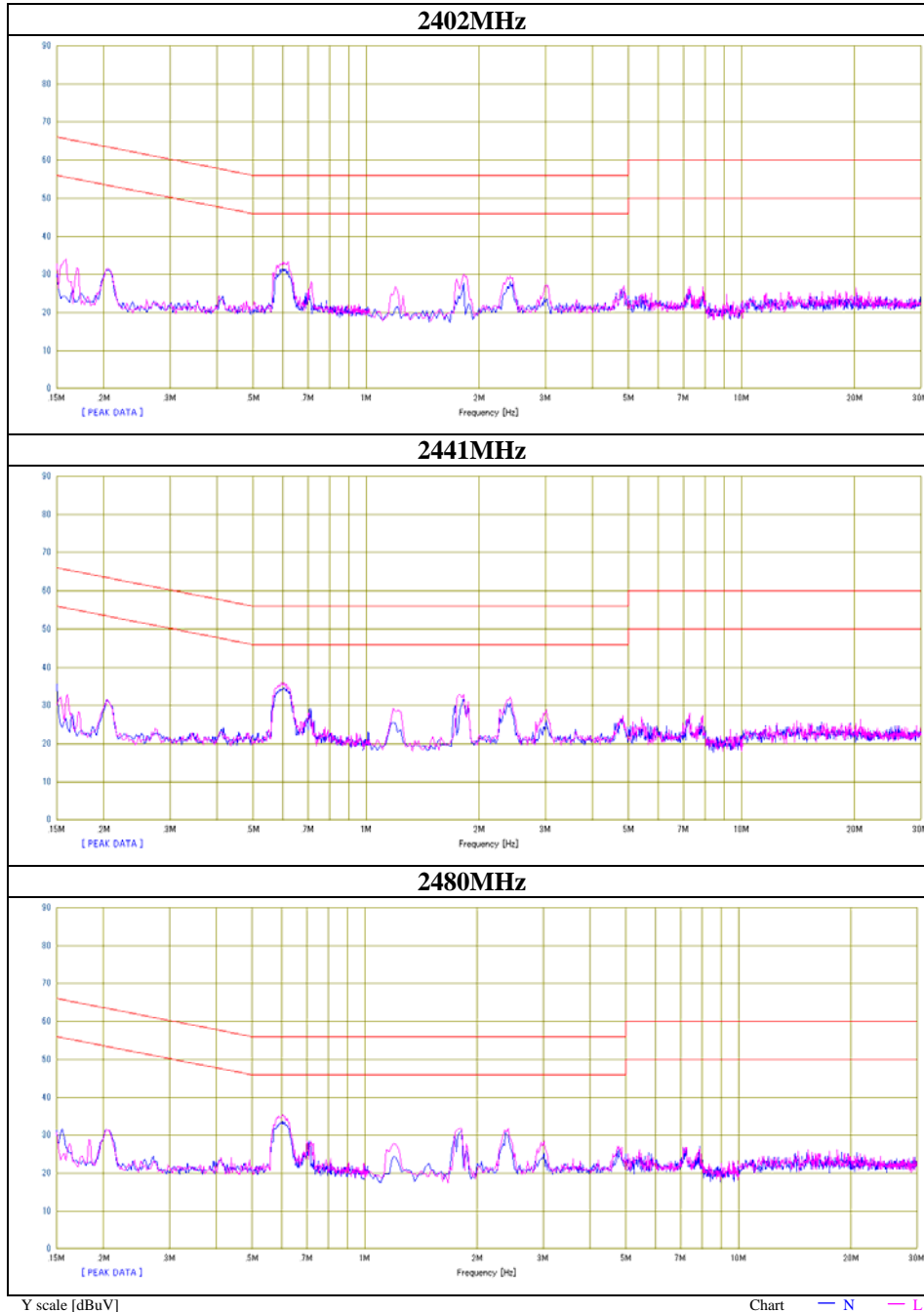


Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
0.15000	3.7	-2.4	13.2	16.9	10.8	66.0	56.0	49.1	45.2	N
0.20579	0.2	4.9	13.2	13.4	18.1	63.4	53.4	50.0	35.3	N
0.60371	17.2	13.3	13.3	30.5	26.6	56.0	46.0	25.5	19.4	N
1.20733	6.1	1.2	13.3	19.4	14.5	56.0	46.0	36.6	31.5	N
1.81111	14.0	7.9	13.4	27.4	21.3	56.0	46.0	28.6	24.7	N
2.41454	12.3	6.0	13.4	25.7	19.4	56.0	46.0	30.3	26.6	N
3.01705	5.6	-0.3	13.5	19.1	13.2	56.0	46.0	36.9	32.8	N
0.15472	1.5	-2.8	13.1	14.6	10.3	65.7	55.7	51.1	45.4	L
0.20905	0.0	-4.9	13.2	13.2	8.3	63.2	53.2	50.0	44.9	L
0.60336	20.1	16.3	13.3	33.4	29.6	56.0	46.0	22.6	16.4	L
1.20646	12.2	7.4	13.3	25.5	20.7	56.0	46.0	30.5	25.3	L
1.81018	17.2	11.1	13.4	30.6	24.5	56.0	46.0	25.4	21.5	L
2.41366	15.7	9.4	13.4	29.1	22.8	56.0	46.0	26.9	23.2	L
3.01645	11.5	5.3	13.5	25.0	18.8	56.0	46.0	31.0	27.2	L

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT=READING+C. F (LISN LOSS+ATT LOSS +CABLE LOSS)  
Except for the above table : adequate margin data below the limits.

## Conducted Emission

Test place	Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No.	30LE0092-HO-01
Date	11/14/2011
Temperature/ Humidity	20 deg.C/ 48% RH
Engineer	Hiroshi Kukita
Mode	Tx DH5



## Conducted Emission

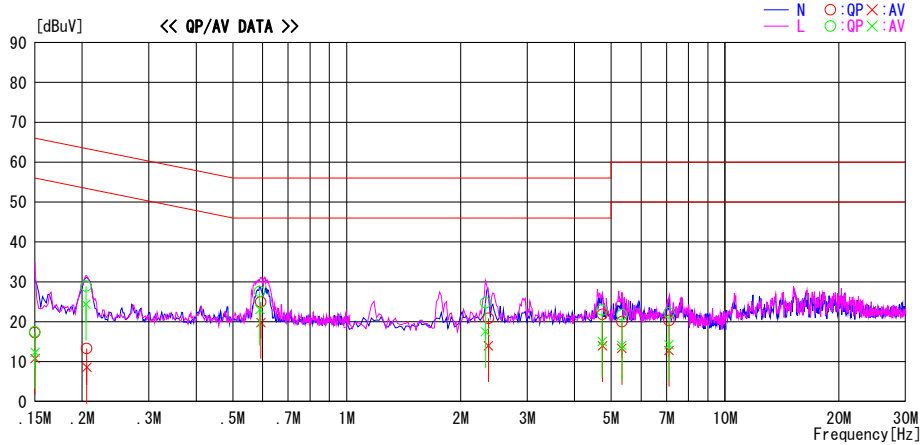
### DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2011/11/14

Report No. : 30LE0092-HO  
 Power : AC 120V / 60Hz  
 Temp./Humi. : 20deg. C / 48% RH  
 Engineer : Hiroshi Kukita

Mode / Remarks : BT Tx 3DH5 2441MHz

LIMIT : FCC15.207 QP  
 FCC15.207 AV

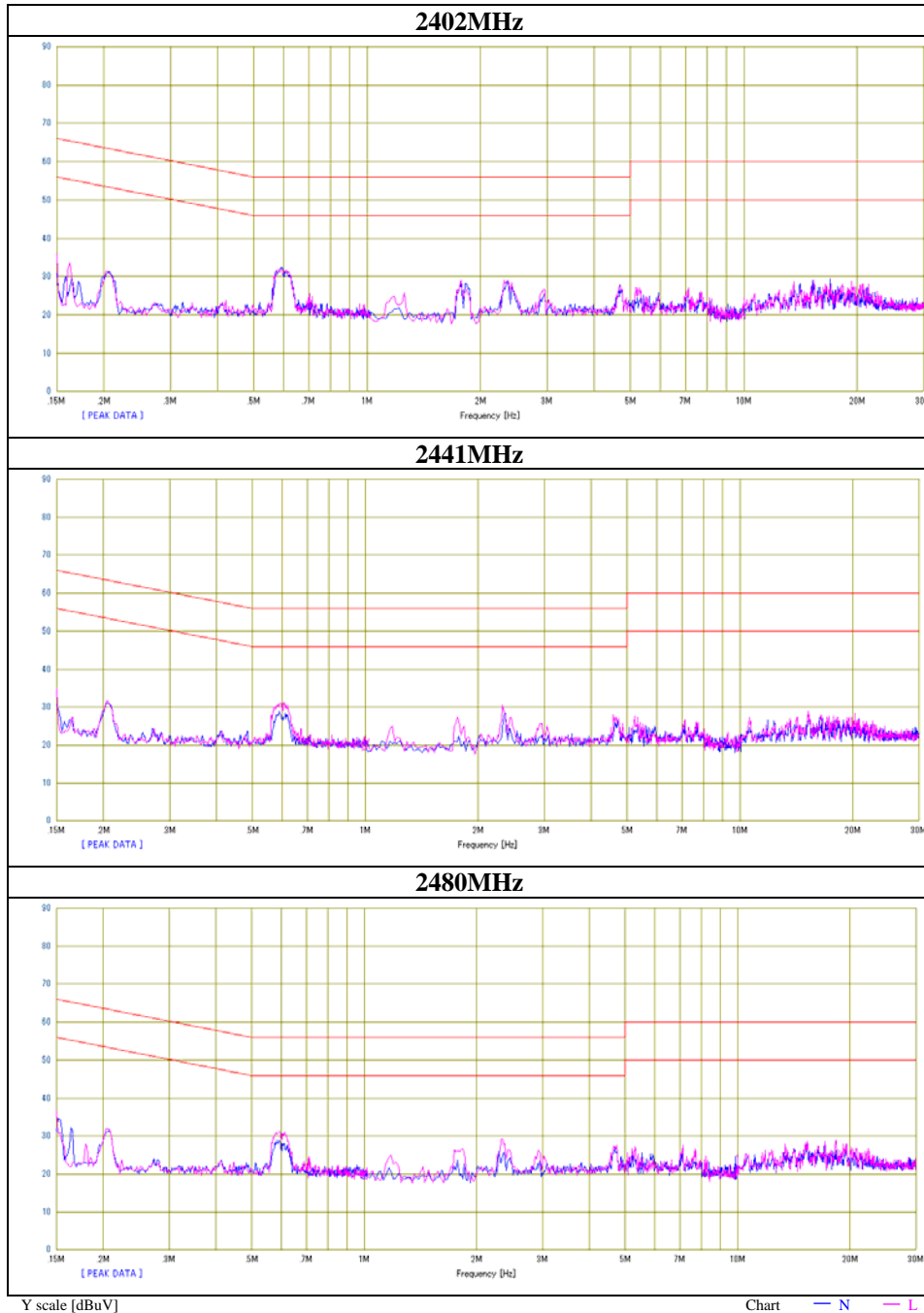


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
0.15000	4.1	-2.4	13.2	17.3	10.8	66.0	56.0	48.7	45.2	N
0.20579	0.1	-4.6	13.2	13.3	8.6	63.4	53.4	50.1	44.8	N
0.59310	11.6	6.5	13.3	24.9	19.8	56.0	46.0	31.1	26.2	N
2.36860	7.4	0.6	13.4	20.8	14.0	56.0	46.0	35.2	32.0	N
4.74251	8.2	0.4	13.6	21.8	14.0	56.0	46.0	34.2	32.0	N
5.33520	6.3	-0.4	13.7	20.0	13.3	60.0	50.0	40.0	36.7	N
7.11080	6.5	-1.0	13.8	20.3	12.8	60.0	50.0	39.7	37.2	N
0.15000	4.3	-0.9	13.2	17.5	12.3	66.0	56.0	48.5	43.7	L
0.20460	15.7	11.2	13.2	28.9	24.4	63.4	53.4	34.5	29.0	L
0.58960	14.3	9.8	13.3	27.6	23.1	56.0	46.0	28.4	22.9	L
2.32704	11.3	4.1	13.4	24.7	17.5	56.0	46.0	31.3	28.5	L
4.73320	9.3	1.5	13.6	22.9	15.1	56.0	46.0	33.1	30.9	L
5.33840	8.0	0.4	13.7	21.7	14.1	60.0	50.0	38.3	35.9	L
7.11280	8.4	0.4	13.8	22.2	14.2	60.0	50.0	37.8	35.8	L

CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT=READING+C.F(LISN LOSS+ATT LOSS +CABLE LOSS)  
 Except for the above table : adequate margin data below the limits.

## Conducted Emission

Test place	Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No.	30LE0092-HO-01
Date	11/14/2011
Temperature/ Humidity	20 deg.C/ 48% RH
Engineer	Hiroshi Kukita
Mode	Tx 3DH5

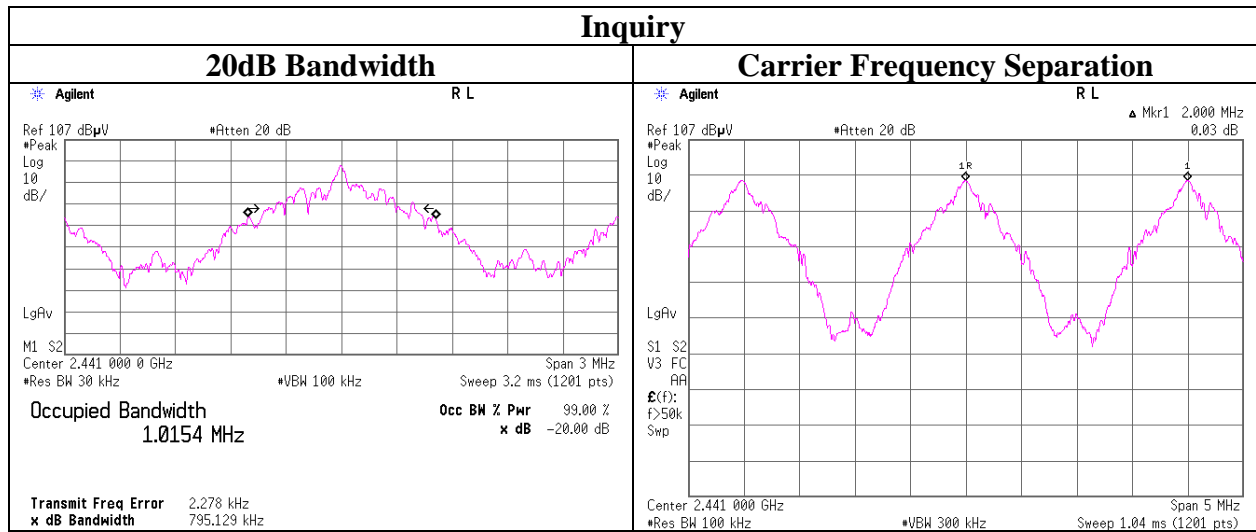


## 20dB Bandwidth and Carrier Frequency Separation

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	30LE0092-HO-01
Date	11/10/2011
Temperature/ Humidity	22 deg.C/ 51% RH
Engineer	Satofumi Matsuyama
Mode	Tx (Hopping on) DH5/3DH5/Inquiry

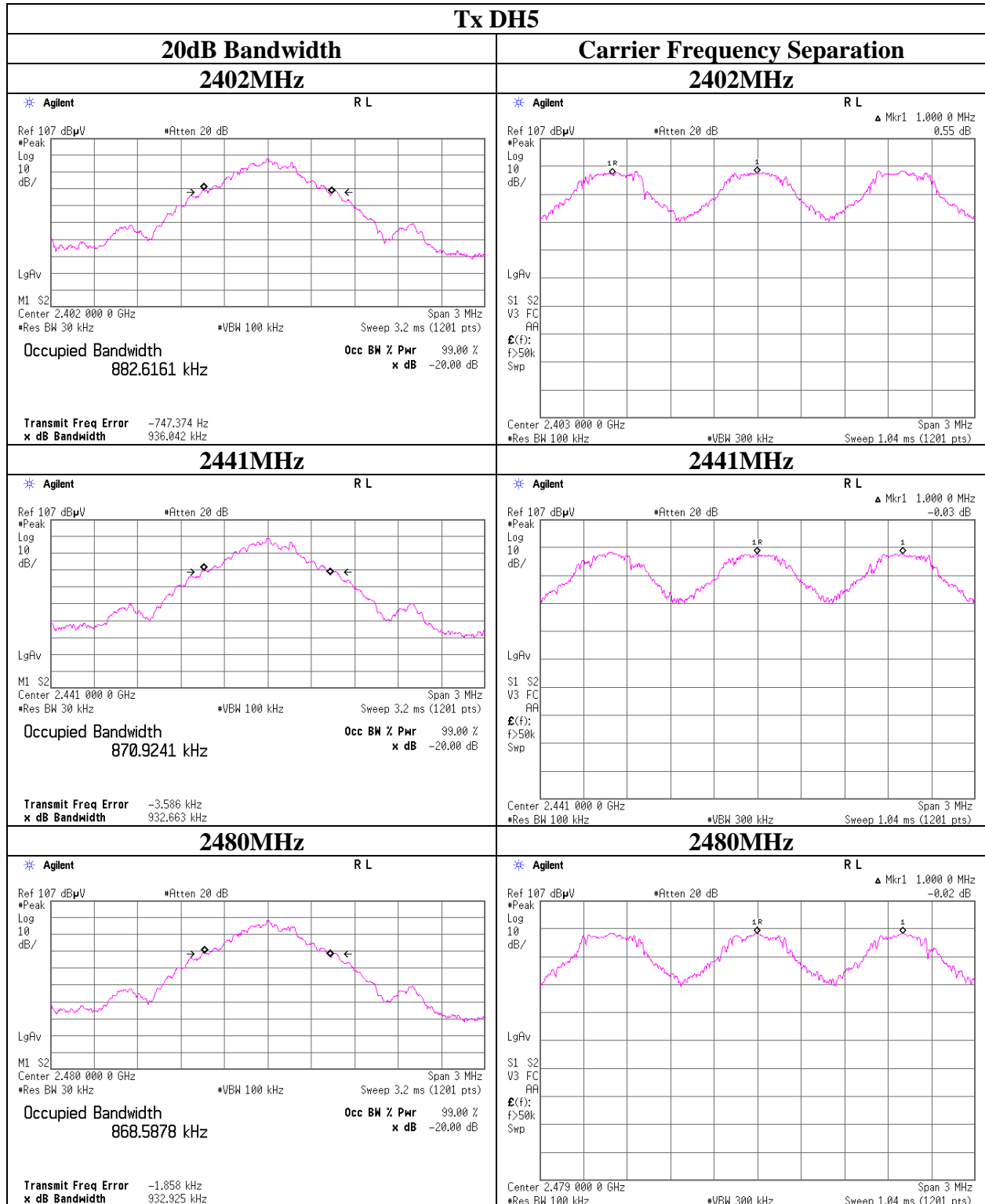
Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.936	1.000	$\geq 0.624$
DH5	2441.0	0.933	1.000	$\geq 0.622$
DH5	2480.0	0.933	1.000	$\geq 0.622$
3DH5	2402.0	1.267	1.000	$\geq 0.845$
3DH5	2441.0	1.261	1.000	$\geq 0.841$
3DH5	2480.0	1.261	1.000	$\geq 0.841$
Inquiry	2441.0	0.795	2.000	$\geq 0.530$

Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).  
No limit applies to 20dB Bandwidth.

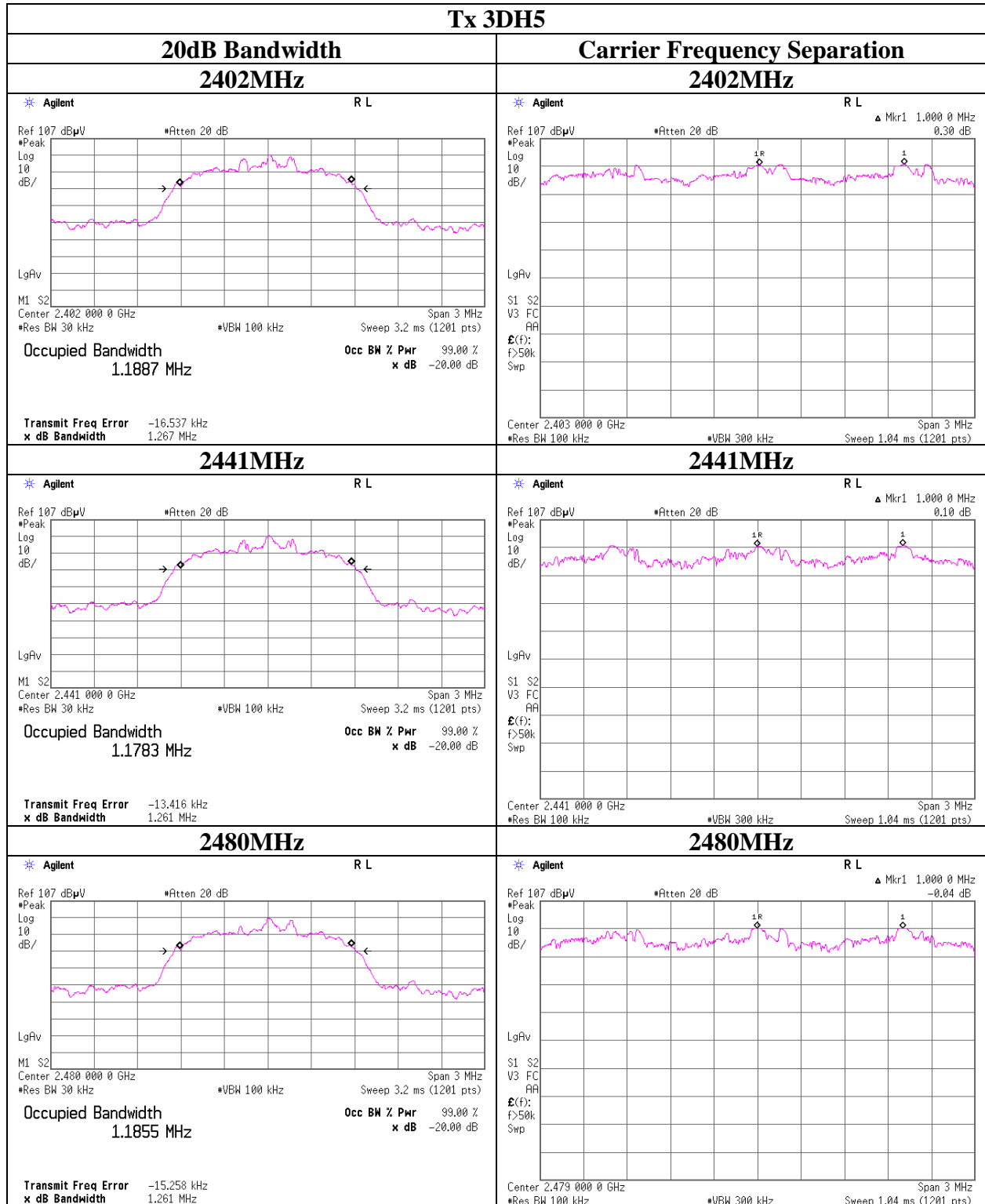




## 20dB Bandwidth and Carrier Frequency Separation



## 20dB Bandwidth and Carrier Frequency Separation

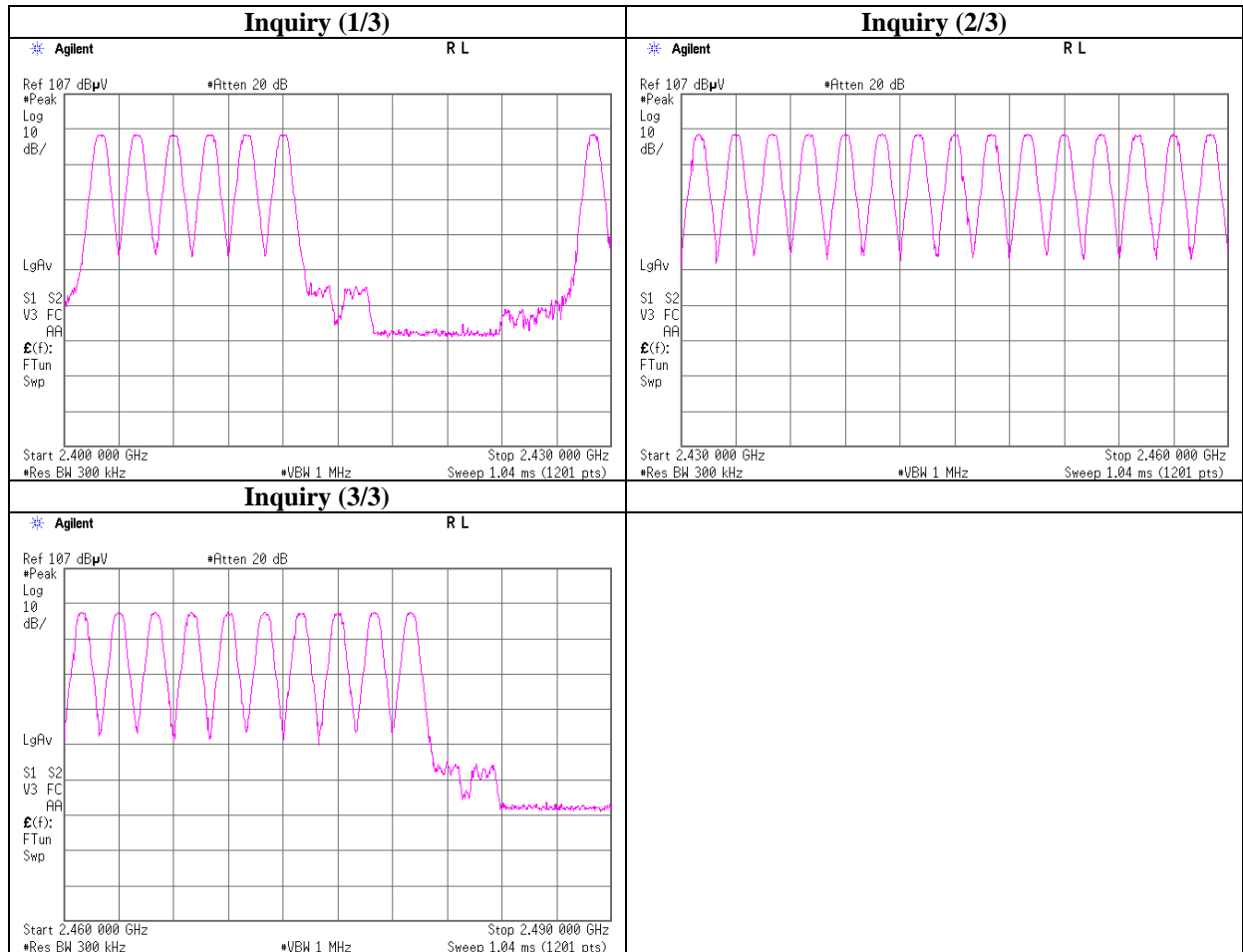


## Number of Hopping Frequency

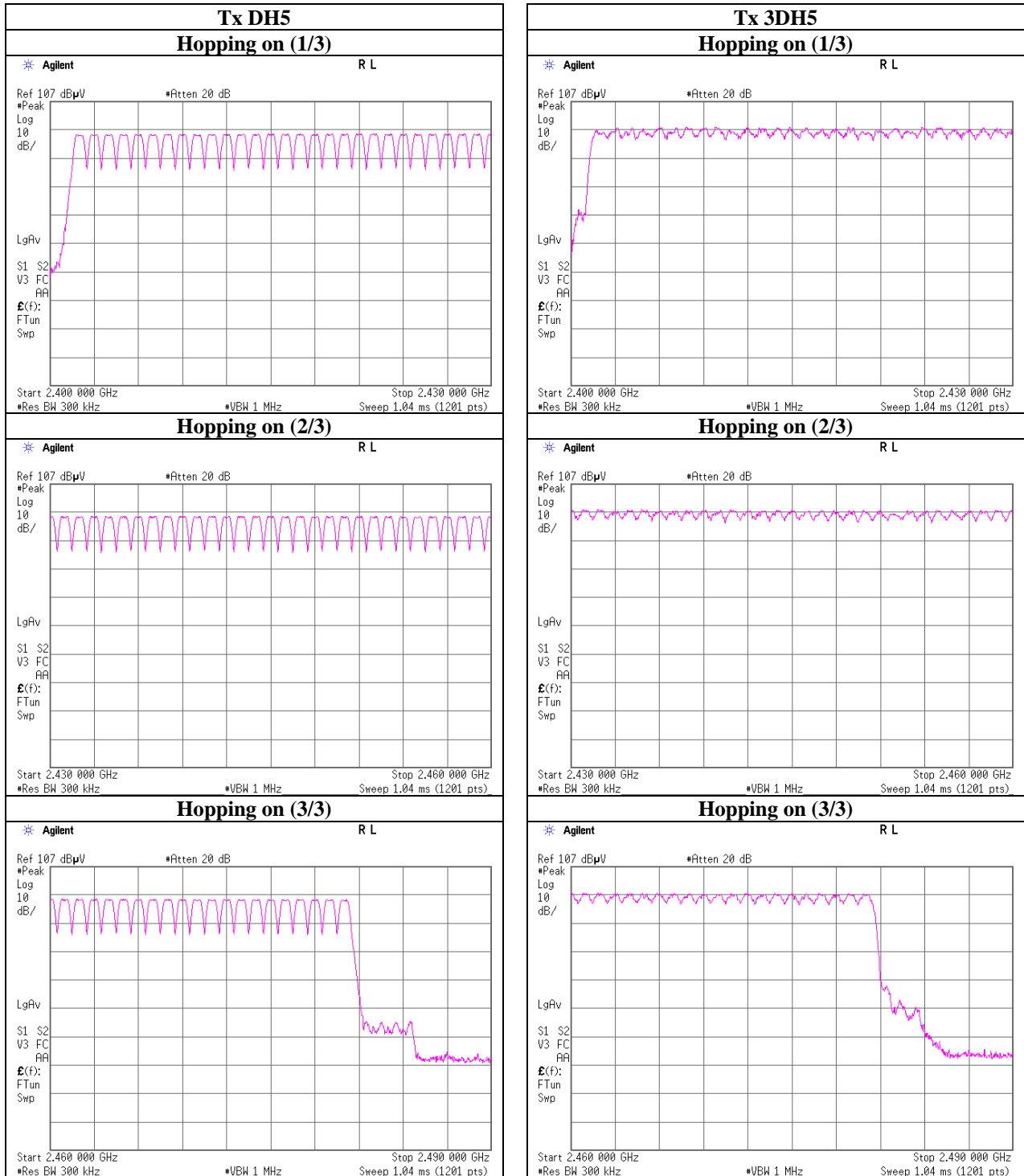
Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	30LE0092-HO-01
Date	11/10/2011
Temperature/ Humidity	22 deg.C/ 51% RH
Engineer	Satofumi Matsuyama
Mode	Tx (Hopping on) DH5/3DH5/Inquiry

Mode	Number of channel [times]	Limit [times]
DH5	79	>= 15
3DH5	79	>= 15
Inquiry	32	>= 15

Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.



## Number of Hopping Frequency



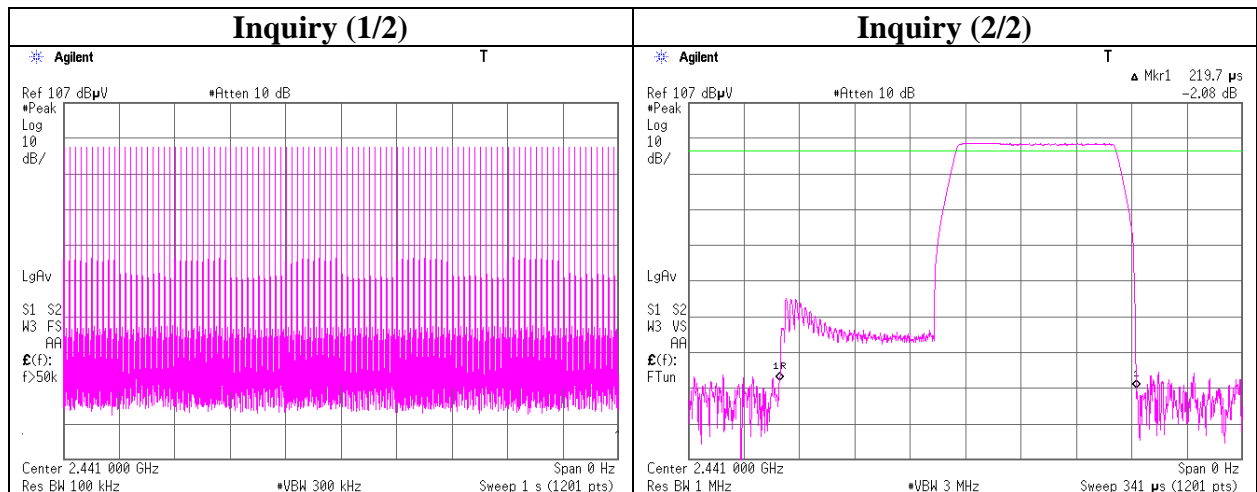
## Dwell time

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	30LE0092-HO-01
Date	11/10/2011
Temperature/ Humidity	22 deg.C/ 51% RH
Engineer	Satofumi Matsuyama
Mode	Tx (Hopping on) DH5/3DH5/Inquiry

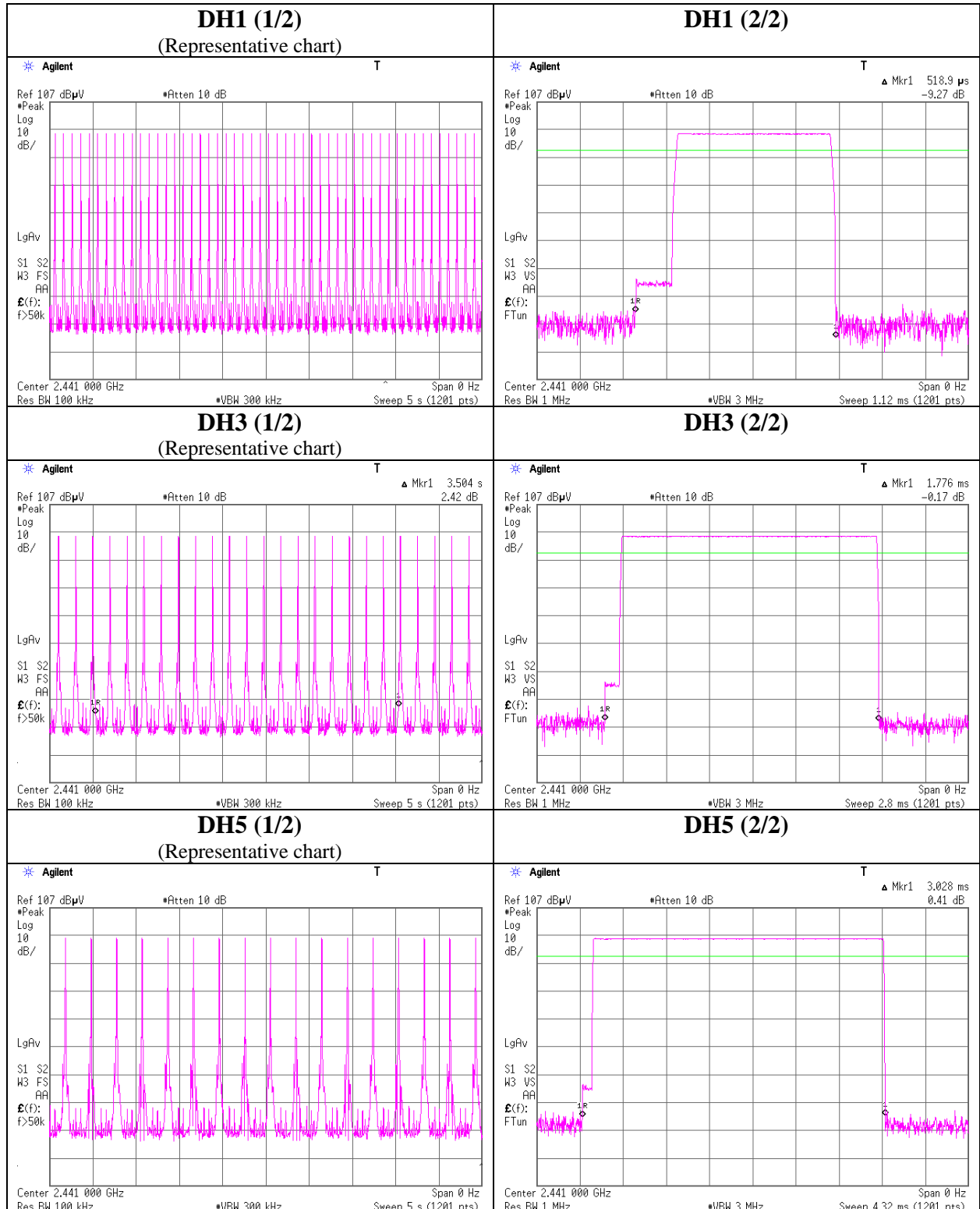
Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8(32 Hopping x 0.4)second period	Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	50.0 times / 5 sec. x 31.6 sec. = 316 times	0.519	164	400
DH3	25.0 times / 5 sec. x 31.6 sec. = 158 times	1.776	281	400
DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	3.028	327	400
3DH1	50.0 times / 5 sec. x 31.6 sec. = 316 times	0.526	166	400
3DH3	25.0 times / 5 sec. x 31.6 sec. = 158 times	1.786	282	400
3DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	3.035	328	400
Inquiry	100.0 times / 1 sec. x 12.8 sec. = 1280 times	0.220	281	400

Sample Calculation

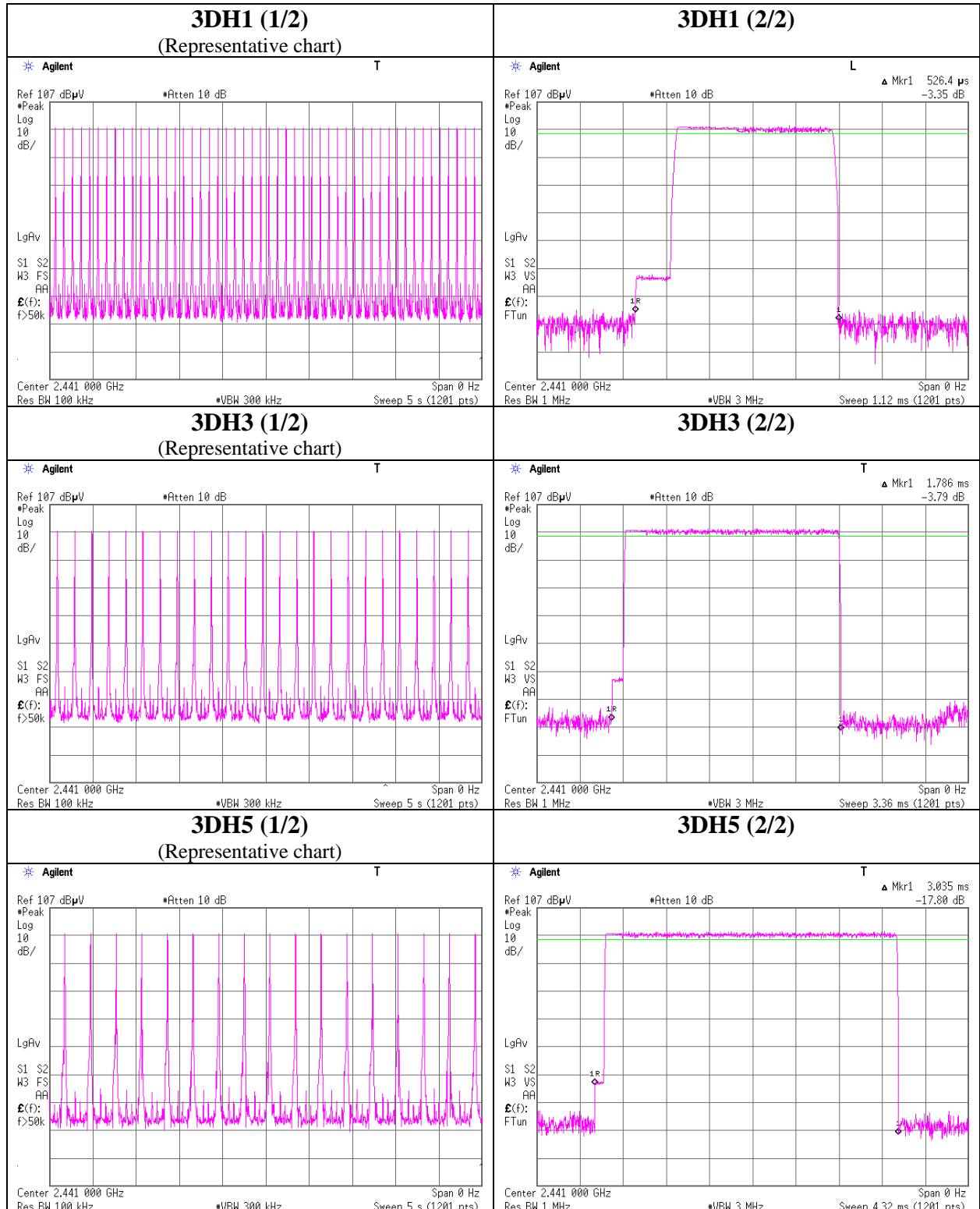
Result = Number of transmission x Length of transimtion time



**Dwell time**



**Dwell time**



## Maximum Peak Output Power

Test place : Head Office EMC Lab. No.6 Measurement Room  
 Report No. : 30LE0092-HO-01  
 Date : 11/10/2011  
 Temperature/ Humidity : 22 deg.C/ 51% RH  
 Engineer : Satofumi Matsuyama  
 Mode : Tx (Hopping off) DH5/3DH5/Inquiry

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-11.55	0.80	10.07	-0.68	0.86	20.97	125	21.65
DH5	2441.0	-11.38	0.80	10.07	-0.51	0.89	20.97	125	21.48
DH5	2480.0	-11.15	0.81	10.07	-0.27	0.94	20.97	125	21.24
3DH5	2402.0	-8.36	0.80	10.07	2.51	1.78	20.97	125	18.46
3DH5	2441.0	-8.38	0.80	10.07	2.49	1.77	20.97	125	18.48
3DH5	2480.0	-8.85	0.81	10.07	2.03	1.60	20.97	125	18.94
Inquiry	2441.0	-11.43	0.80	10.07	-0.56	0.88	20.97	125	21.53

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.

As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.



## Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 30LE0092-HO-01  
Date : 11/12/2011 11/13/2011  
Temperature/ Humidity : 25 deg.C/ 32% RH 21 deg.C/ 63% RH  
Engineer : Hiroshi Kukita Satofumi Matsuyama  
(1-10GHz) (Below 1GHz, Above 10GHz)  
Mode : Tx, DH5 2402MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	80.002	QP	34.7	6.6	7.7	32.1	16.9	40.0	23.1	
Hori	176.276	QP	33.4	15.6	8.8	32.0	25.8	43.5	17.7	
Hori	364.489	QP	45.9	17.2	10.2	32.1	41.2	46.0	4.8	
Hori	391.494	QP	38.2	17.6	10.3	32.1	34.0	46.0	12.0	
Hori	728.979	QP	35.2	22.6	12.3	32.1	38.0	46.0	8.0	
Hori	798.109	QP	31.6	23.2	12.7	31.8	35.7	46.0	10.3	
Hori	1602.017	PK	47.5	25.5	2.1	33.2	41.9	73.9	32.0	
Hori	2390.000	PK	45.0	28.1	2.5	32.2	43.4	73.9	30.5	
Hori	2400.000	PK	60.4	28.1	2.5	32.2	58.8	73.9	15.1	
Hori	3203.909	PK	44.7	28.7	2.9	31.9	44.4	73.9	29.5	
Hori	4804.000	PK	50.7	31.2	5.3	31.4	55.8	73.9	18.1	
Hori	7206.000	PK	40.8	35.6	6.1	32.4	50.1	73.9	23.8	
Hori	9608.000	PK	43.1	38.3	7.1	33.2	55.3	73.9	18.6	
Hori	24020.000	PK	45.4	38.8	-0.9	31.6	51.7	73.9	22.2	
Hori	1602.017	AV	41.2	25.5	2.1	33.2	35.6	53.9	18.3	
Hori	2390.000	AV	32.5	28.1	2.5	32.2	30.9	53.9	23.0	
Hori	2400.000	AV	50.0	28.1	2.5	32.2	48.4	53.9	5.5	
Hori	3203.909	AV	37.0	28.7	2.9	31.9	36.7	53.9	17.2	
Hori	24020.000	AV	33.3	38.8	-0.9	31.6	39.6	53.9	14.3	
Vert	80.000	QP	53.9	6.6	7.7	32.1	36.1	40.0	3.9	
Vert	176.596	QP	41.5	15.6	8.8	32.0	33.9	43.5	9.6	
Vert	364.486	QP	48.3	17.2	10.2	32.1	43.6	46.0	2.4	
Vert	391.493	QP	43.1	17.6	10.3	32.1	38.9	46.0	7.1	
Vert	728.982	QP	38.8	22.6	12.3	32.1	41.6	46.0	4.4	
Vert	798.450	QP	34.5	23.2	12.7	31.8	38.6	46.0	7.4	
Vert	1602.000	PK	49.3	25.5	2.1	33.2	43.7	73.9	30.2	
Vert	2390.000	PK	44.8	28.1	2.5	32.2	43.2	73.9	30.7	
Vert	2400.000	PK	61.4	28.1	2.5	32.2	59.8	73.9	14.1	
Vert	3203.909	PK	44.4	28.7	2.9	31.9	44.1	73.9	29.8	
Vert	4804.000	PK	51.5	31.2	3.7	31.4	55.0	73.9	18.9	
Vert	7206.000	PK	42.9	35.6	6.1	32.4	52.2	73.9	21.7	
Vert	9608.000	PK	42.4	38.3	7.1	33.2	54.6	73.9	19.3	
Vert	24020.000	PK	45.2	38.8	-0.9	31.6	51.5	73.9	22.4	
Vert	1602.000	AV	44.4	25.5	2.1	33.2	38.8	53.9	15.1	
Vert	2390.000	AV	32.6	28.1	2.5	32.2	31.0	53.9	22.9	
Vert	2400.000	AV	50.9	28.1	2.5	32.2	49.3	53.9	4.6	
Vert	3203.909	AV	29.9	28.7	2.9	31.9	29.6	53.9	24.3	
Vert	24020.000	AV	33.3	38.8	-0.9	31.6	39.6	53.9	14.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

\*For the band edge of the carrier and the harmonics that emission was found, the test was performed with VBW of the average detector set at 270Hz. For other average detectors, VBW was set at 10Hz.



## Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 and 3 Semi Anechoic Chamber  
Report No. 30LE0092-HO-01  
Date 11/12/2011 11/13/2011  
Temperature/ Humidity 25 deg.C/ 32% RH 21 deg.C/ 63% RH  
Engineer Hiroshi Kukita Satofumi Matsuyama  
(1-10GHz) (Below 1GHz, Above 10GHz)  
Mode Tx, DH5 2441MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	80.000	QP	31.5	6.4	7.9	32.1	13.7	40.0	26.3	
Hori	172.276	QP	29.5	15.9	8.9	32.0	22.3	43.5	21.2	
Hori	364.491	QP	39.7	16.6	10.4	32.0	34.7	46.0	11.3	
Hori	480.054	QP	33.6	18.2	11.2	32.0	31.0	46.0	15.0	
Hori	532.248	QP	29.4	18.7	11.5	32.0	27.6	46.0	18.4	
Hori	728.981	QP	33.6	21.0	12.5	31.8	35.3	46.0	10.7	
Hori	1628.002	PK	48.3	25.5	2.1	33.1	42.8	73.9	31.1	
Hori	3256.002	PK	46.0	28.8	3.0	31.9	45.9	73.9	28.0	
Hori	4882.000	PK	55.0	31.4	5.3	31.4	60.3	73.9	13.6	
Hori	7323.000	PK	44.3	35.7	6.2	32.5	53.7	73.9	20.2	
Hori	9764.000	PK	44.1	38.5	7.3	33.2	56.7	73.9	17.2	
Hori	24410.000	PK	44.6	38.6	-0.9	31.6	50.7	73.9	23.2	
Hori	1628.002	AV	42.5	25.5	2.1	33.1	37.0	53.9	16.9	
Hori	3256.002	AV	38.3	28.8	3.0	31.9	38.2	53.9	15.7	
Hori	24410.000	AV	33.3	38.6	-0.9	31.6	39.4	53.9	14.5	
Vert	79.999	QP	50.3	6.4	7.9	32.1	32.5	40.0	7.5	
Vert	171.172	QP	43.4	15.8	8.9	32.0	36.1	43.5	7.4	
Vert	364.491	QP	44.1	16.6	10.4	32.0	39.1	46.0	6.9	
Vert	480.053	QP	37.6	18.2	11.2	32.0	35.0	46.0	11.0	
Vert	531.778	QP	43.6	18.7	11.5	32.0	41.8	46.0	4.2	
Vert	728.981	QP	37.1	21.0	12.5	31.8	38.8	46.0	7.2	
Vert	1628.011	PK	50.0	25.5	2.1	33.1	44.5	73.9	29.4	
Vert	3255.976	PK	47.8	28.8	3.0	31.9	47.7	73.9	26.2	
Vert	4882.000	PK	51.0	31.4	5.3	31.4	56.3	73.9	17.6	
Vert	7323.000	PK	44.1	35.7	6.2	32.5	53.5	73.9	20.4	
Vert	9764.000	PK	43.7	38.5	7.3	33.2	56.3	73.9	17.6	
Vert	24410.000	PK	44.5	38.6	-0.9	31.6	50.6	73.9	23.3	
Vert	1628.011	AV	45.8	25.5	2.1	33.1	40.3	53.9	13.6	
Vert	3255.976	AV	40.1	28.8	3.0	31.9	40.0	53.9	13.9	
Vert	24410.000	AV	33.3	38.6	-0.9	31.6	39.4	53.9	14.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

\*For the band edge of the carrier and the harmonics that emission was found, the test was performed with VBW of the average detector set at 270Hz. For other average detectors, VBW was set at 10Hz.

## Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. 30LE0092-HO-01  
Date 11/12/2011  
Temperature/ Humidity 25 deg.C/ 32% RH  
Engineer Hiroshi Kukita  
(1-10GHz)  
Mode Tx, DH5 2441MHz

**Dwell time factor relaxation**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4882.000	AV	51.5	31.4	5.3	31.4	-29.8	27.0	53.9	26.9	
Hori	7323.000	AV	30.2	35.7	6.2	32.5	-29.8	9.8	53.9	44.1	
Hori	9764.000	AV	30.9	38.5	7.3	33.2	-29.8	13.7	53.9	40.2	
Vert	4882.000	AV	47.3	31.4	5.3	31.4	-29.8	22.8	53.9	31.1	
Vert	7323.000	AV	30.3	35.7	6.2	32.5	-29.8	9.9	53.9	44.0	
Vert	9764.000	AV	30.9	38.5	7.3	33.2	-29.8	13.7	53.9	40.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz))

- Gain(Amplifier) + Dwell time factor (Refer to dwell time data sheet)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB



## Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 30LE0092-HO-01  
Date : 11/12/2011  
Temperature/ Humidity : 25 deg.C/ 32% RH  
Engineer : Hiroshi Kukita  
(1-10GHz)  
Mode : Tx, DH5 2480MHz

**Dwell time factor relaxation**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4960.000	AV	52.1	31.6	5.3	31.4	-29.8	27.8	53.9	26.1	
Hori	7440.000	AV	32.3	35.8	6.2	32.5	-29.8	12.0	53.9	41.9	
Hori	9920.000	AV	32.2	38.6	7.4	33.3	-29.8	15.1	53.9	38.8	
Vert	4960.000	AV	48.1	31.6	5.3	31.4	-29.8	23.8	53.9	30.1	
Vert	7440.000	AV	30.3	35.8	6.2	32.5	-29.8	10.0	53.9	43.9	
Vert	9920.000	AV	30.7	38.6	7.4	33.3	-29.8	13.6	53.9	40.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz))  
- Gain(Amplifier) + Dwell time factor (Refer to dwell time data sheet)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

## Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 and 3 Semi Anechoic Chamber  
Report No. 30LE0092-HO-01  
Date 11/12/2011 11/13/2011  
Temperature/ Humidity 25 deg.C/ 32% RH 21 deg.C/ 63% RH  
Engineer Hiroshi Kukita Satofumi Matsuyama  
(1-10GHz) (Below 1GHz, Above 10GHz)  
Mode Tx, 3DH5 2402MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	108.835	QP	32.0	11.4	8.3	32.1	19.6	43.5	23.9	
Hori	176.434	QP	27.3	16.0	9.0	32.0	20.3	43.5	23.2	
Hori	364.489	QP	40.1	16.6	10.4	32.0	35.1	46.0	10.9	
Hori	480.059	QP	34.0	18.2	11.2	32.0	31.4	46.0	14.6	
Hori	531.136	QP	28.8	18.7	11.5	32.0	27.0	46.0	19.0	
Hori	728.985	QP	32.1	21.0	12.5	31.8	33.8	46.0	12.2	
Hori	1602.025	PK	48.4	25.5	2.1	33.2	42.8	73.9	31.1	
Hori	2390.000	PK	45.7	28.1	2.5	32.2	44.1	73.9	29.8	
Hori	2400.000	PK	69.7	28.1	2.5	32.2	68.1	-	-	See 20dBc Data Sheet
Hori	4804.000	PK	51.4	31.2	3.7	31.4	54.9	73.9	19.0	
Hori	7206.000	PK	43.8	35.6	4.6	32.4	51.6	73.9	22.3	
Hori	9608.000	PK	43.7	38.3	5.2	33.2	54.0	73.9	19.9	
Hori	24020.000	PK	44.6	38.8	-0.9	31.6	50.9	73.9	23.0	
Hori	1602.025	AV	44.0	25.5	2.1	33.2	38.4	53.9	15.5	
Hori	2390.000	AV	33.5	28.1	2.5	32.2	31.9	53.9	22.0	
Hori	2400.000	AV	56.0	28.1	2.5	32.2	54.4	-	-	See 20dBc Data Sheet
Hori	24020.000	AV	33.3	38.8	-0.9	31.6	39.6	53.9	14.3	
Vert	107.508	QP	45.9	11.2	8.2	32.1	33.2	43.5	10.3	
Vert	176.421	QP	43.7	16.0	9.0	32.0	36.7	43.5	6.8	
Vert	364.492	QP	44.4	16.6	10.4	32.0	39.4	46.0	6.6	
Vert	480.061	QP	37.9	18.2	11.2	32.0	35.3	46.0	10.7	
Vert	530.890	QP	42.9	18.7	11.5	32.0	41.1	46.0	4.9	
Vert	728.980	QP	35.5	21.0	12.5	31.8	37.2	46.0	8.8	
Vert	1602.033	PK	48.6	25.5	2.1	33.2	43.0	73.9	30.9	
Vert	2390.000	PK	46.0	28.1	2.5	32.2	44.4	73.9	29.5	
Vert	2400.000	PK	70.9	28.1	2.5	32.2	69.3	-	-	See 20dBc Data Sheet
Vert	4804.000	PK	49.3	31.2	3.7	31.4	52.8	73.9	21.1	
Vert	7206.000	PK	43.3	35.6	4.6	32.4	51.1	73.9	22.8	
Vert	9608.000	PK	42.8	38.3	5.2	33.2	53.1	73.9	20.8	
Vert	24020.000	PK	44.9	38.8	-0.9	31.6	51.2	73.9	22.7	
Vert	1602.033	AV	43.0	25.5	2.1	33.2	37.4	53.9	16.5	
Vert	2390.000	AV	34.1	28.1	2.5	32.2	32.5	53.9	21.4	
Vert	2400.000	AV	57.5	28.1	2.5	32.2	55.9	-	-	See 20dBc Data Sheet
Vert	24020.000	AV	33.3	38.8	-0.9	31.6	39.6	53.9	14.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

\*For the band edge of the carrier and the harmonics that emission was found, the test was performed with VBW of the average detector set at 270Hz. For other average detectors, VBW was set at 10Hz.

## Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 30LE0092-HO-01  
Date : 11/12/2011  
Temperature/ Humidity : 25 deg.C/ 32% RH  
Engineer : Hiroshi Kukita  
(1-10GHz)  
Mode : Tx, 3DH5 2402MHz

**20dBc Data Sheet**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	96.0	28.1	2.5	32.2	94.4	-	-	Carrier
Hori	2400.000	PK	47.6	28.1	2.5	32.2	46.0	74.4	28.4	
Vert	2402.000	PK	97.5	28.1	2.5	32.2	95.9	-	-	Carrier
Vert	2400.000	PK	49.3	28.1	2.5	32.2	47.7	75.9	28.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

**Dwell time factor relaxation**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4804.000	AV	32.9	31.2	3.7	31.4	-30.0	6.4	53.9	47.5	
Hori	7206.000	AV	32.1	35.6	4.6	32.4	-30.0	9.9	53.9	44.0	
Hori	9608.000	AV	32.0	38.3	5.2	33.2	-30.0	12.3	53.9	41.6	
Vert	4804.000	AV	30.0	31.2	3.7	31.4	-30.0	3.5	53.9	50.4	
Vert	7206.000	AV	30.3	35.6	4.6	32.4	-30.0	8.1	53.9	45.8	
Vert	9608.000	AV	30.4	38.3	5.2	33.2	-30.0	10.7	53.9	43.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz))

- Gain(Amplifier) + Dwell time factor (Refer to dwell time data sheet)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB



## Radiated Spurious Emission

Test place	Head Office EMC Lab. No.4 and 3 Semi Anechoic Chamber	
Report No.	30LE0092-HO-01	
Date	11/12/2011	11/13/2011
Temperature/ Humidity	25 deg.C/ 32% RH	21 deg.C/ 63% RH
Engineer	Hiroshi Kukita	Satofumi Matsuyama
	(1-10GHz)	(Below 1GHz, Above 10GHz)
Mode	Tx, 3DH5 2441MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	107.784	QP	32.1	11.2	8.2	32.1	19.4	43.5	24.1	
Hori	176.434	QP	27.5	16.0	9.0	32.0	20.5	43.5	23.0	
Hori	364.490	QP	40.5	16.6	10.4	32.0	35.5	46.0	10.5	
Hori	480.055	QP	34.2	18.2	11.2	32.0	31.6	46.0	14.4	
Hori	531.029	QP	28.1	18.7	11.5	32.0	26.3	46.0	19.7	
Hori	728.987	QP	32.6	21.0	12.5	31.8	34.3	46.0	11.7	
Hori	1628.000	PK	48.5	25.5	2.1	33.1	43.0	73.9	30.9	
Hori	4882.000	PK	55.8	31.4	3.7	31.4	59.5	73.9	14.4	
Hori	7323.000	PK	43.2	35.7	4.7	32.5	51.1	73.9	22.8	
Hori	9764.000	PK	43.4	38.5	5.3	33.2	54.0	73.9	19.9	
Hori	24410.000	PK	44.8	38.6	-0.9	31.6	50.9	73.9	23.0	
Hori	1628.000	AV	43.4	25.5	2.1	33.1	37.9	53.9	16.0	
Hori	24410.000	AV	33.4	38.6	-0.9	31.6	39.5	53.9	14.4	
Vert	107.508	QP	43.6	11.2	8.2	32.1	30.9	43.5	12.6	
Vert	174.244	QP	45.0	16.0	8.9	32.0	37.9	43.5	5.6	
Vert	364.493	QP	44.8	16.6	10.4	32.0	39.8	46.0	6.2	
Vert	480.057	QP	38.3	18.2	11.2	32.0	35.7	46.0	10.3	
Vert	531.039	QP	42.9	18.7	11.5	32.0	41.1	46.0	4.9	
Vert	728.979	QP	35.4	21.0	12.5	31.8	37.1	46.0	8.9	
Vert	1627.985	PK	50.5	25.5	2.1	33.1	45.0	73.9	28.9	
Vert	4882.000	PK	50.3	31.4	3.7	31.4	54.0	73.9	19.9	
Vert	7323.000	PK	43.1	35.7	4.7	32.5	51.0	73.9	22.9	
Vert	9764.000	PK	43.4	38.5	5.3	33.2	54.0	73.9	19.9	
Vert	24410.000	PK	44.7	38.6	-0.9	31.6	50.8	73.9	23.1	
Vert	1627.985	AV	45.9	25.5	2.1	33.1	40.4	53.9	13.5	
Vert	24410.000	AV	33.4	38.6	-0.9	31.6	39.5	53.9	14.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

\*For the band edge of the carrier and the harmonics that emission was found, the test was performed with VBW of the average detector set at 270Hz. For other average detectors, VBW was set at 10Hz.

## Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. 30LE0092-HO-01  
Date 11/12/2011  
Temperature/ Humidity 25 deg.C/ 32% RH  
Engineer Hiroshi Kukita  
(1-10GHz)  
Mode Tx, 3DH5 2441MHz

**Dwell time factor relaxation**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4882.000	AV	38.0	31.4	3.7	31.4	-30.0	11.7	53.9	42.2	
Hori	7323.000	AV	31.9	35.7	4.7	32.5	-30.0	9.8	53.9	44.1	
Hori	9764.000	AV	32.2	38.5	5.3	33.2	-30.0	12.8	53.9	41.1	
Vert	4882.000	AV	34.7	31.4	3.7	31.4	-30.0	8.4	53.9	45.5	
Vert	7323.000	AV	31.8	35.7	4.7	32.5	-30.0	9.7	53.9	44.2	
Vert	9764.000	AV	32.2	38.5	5.3	33.2	-30.0	12.8	53.9	41.1	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz))

- Gain(Amplifier) + Dwell time factor (Refer to dwell time data sheet)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz  $20\log(3.0m/1.0m) = 9.5dB$

## Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 and 3 Semi Anechoic Chamber  
Report No. 30LE0092-HO-01  
Date 11/12/2011 11/13/2011  
Temperature/ Humidity 25 deg.C/ 32% RH 21 deg.C/ 63% RH  
Engineer Hiroshi Kukita Satofumi Matsuyama  
(1-10GHz) (Below 1GHz, Above 10GHz)  
Mode Tx, 3DH5 2480MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	100.001	QP	33.5	10.0	8.1	32.1	19.5	43.5	24.0	
Hori	175.814	QP	27.6	16.0	8.9	32.0	20.5	43.5	23.0	
Hori	364.492	QP	40.3	16.6	10.4	32.0	35.3	46.0	10.7	
Hori	480.057	QP	34.6	18.2	11.2	32.0	32.0	46.0	14.0	
Hori	530.837	QP	28.4	18.7	11.5	32.0	26.6	46.0	19.4	
Hori	728.977	QP	32.8	21.0	12.5	31.8	34.5	46.0	11.5	
Hori	1653.830	PK	48.6	25.6	2.1	33.1	43.2	73.9	30.7	
Hori	2483.500	PK	62.7	28.5	2.6	32.2	61.6	73.9	12.3	
Hori	4960.000	PK	53.1	31.6	3.7	31.4	57.0	73.9	16.9	
Hori	7440.000	PK	44.0	35.8	4.7	32.5	52.0	73.9	21.9	
Hori	9920.000	PK	42.5	38.6	5.3	33.3	53.1	73.9	20.8	
Hori	24800.000	PK	46.4	38.5	-0.9	31.5	52.5	73.9	21.4	
Hori	1653.830	AV	42.6	25.6	2.1	33.1	37.2	53.9	16.7	
Hori	2483.500	AV	50.0	28.5	2.6	32.2	48.9	53.9	5.0	
Hori	4960.000	AV	38.0	31.6	3.7	31.4	41.9	53.9	12.0	
Hori	7440.000	AV	32.2	35.8	4.7	32.5	40.2	53.9	13.7	
Hori	9920.000	AV	32.1	38.6	5.3	33.3	42.7	53.9	11.2	
Hori	24800.000	AV	34.4	38.5	-0.9	31.5	40.5	53.9	13.4	
Vert	100.002	QP	47.7	10.0	8.1	32.1	33.7	43.5	9.8	
Vert	174.044	QP	44.9	15.9	8.9	32.0	37.7	43.5	5.8	
Vert	364.497	QP	44.7	16.6	10.4	32.0	39.7	46.0	6.3	
Vert	480.055	QP	38.6	18.2	11.2	32.0	36.0	46.0	10.0	
Vert	531.007	QP	42.7	18.7	11.5	32.0	40.9	46.0	5.1	
Vert	728.979	QP	35.3	21.0	12.5	31.8	37.0	46.0	9.0	
Vert	1654.016	PK	48.3	25.6	2.1	33.1	42.9	73.9	31.0	
Vert	2483.500	PK	65.1	28.5	2.6	32.2	64.0	73.9	9.9	
Vert	4960.000	PK	50.2	31.6	3.7	31.4	54.1	73.9	19.8	
Vert	7440.000	PK	43.4	35.8	4.7	32.5	51.4	73.9	22.5	
Vert	9920.000	PK	43.2	38.6	5.3	33.3	53.8	73.9	20.1	
Vert	24800.000	PK	45.7	38.5	-0.9	31.5	51.8	73.9	22.1	
Vert	1654.016	AV	43.2	25.6	2.1	33.1	37.8	53.9	16.1	
Vert	2483.500	AV	51.1	28.5	2.6	32.2	50.0	53.9	3.9	
Vert	4960.000	AV	37.3	31.6	3.7	31.4	41.2	53.9	12.7	
Vert	7440.000	AV	32.2	35.8	4.7	32.5	40.2	53.9	13.7	
Vert	9920.000	AV	32.0	38.6	5.3	33.3	42.6	53.9	11.3	
Vert	24800.000	AV	34.4	38.5	-0.9	31.5	40.5	53.9	13.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz  $20\log(3.0m/1.0m) = 9.5dB$

\*For the band edge of the carrier and the harmonics that emission was found, the test was performed with VBW of the average detector set at 270Hz. For other average detectors, VBW was set at 10Hz.

## Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. 30LE0092-HO-01  
Date 11/12/2011  
Temperature/ Humidity 25 deg.C/ 32% RH  
Engineer Hiroshi Kukita  
(1-10GHz)  
Mode Tx, 3DH5 2480MHz

**Dwell time factor relaxation**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4960.000	AV	38.0	31.6	3.7	31.4	-30.0	11.9	53.9	42.0	
Hori	7440.000	AV	32.2	35.8	4.7	32.5	-30.0	10.2	53.9	43.7	
Hori	9920.000	AV	32.1	38.6	5.3	33.3	-30.0	12.7	53.9	41.2	
Vert	4960.000	AV	37.3	31.6	3.7	31.4	-30.0	11.2	53.9	42.7	
Vert	7440.000	AV	32.2	35.8	4.7	32.5	-30.0	10.2	53.9	43.7	
Vert	9920.000	AV	32.0	38.6	5.3	33.3	-30.0	12.6	53.9	41.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz))

- Gain(Amplifier) + Dwell time factor (Refer to dwell time data sheet)

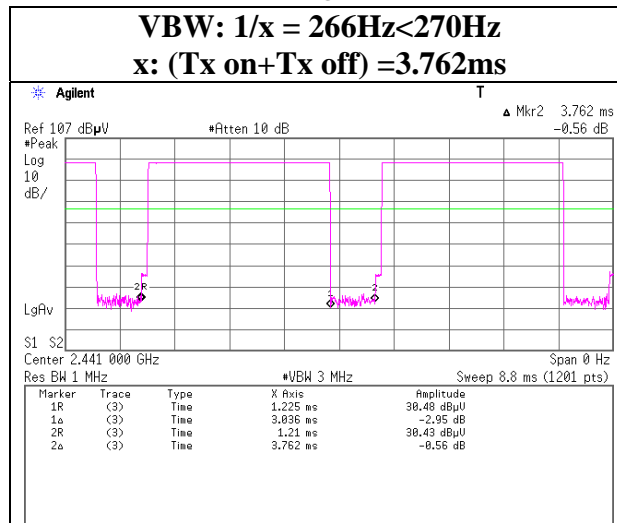
\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

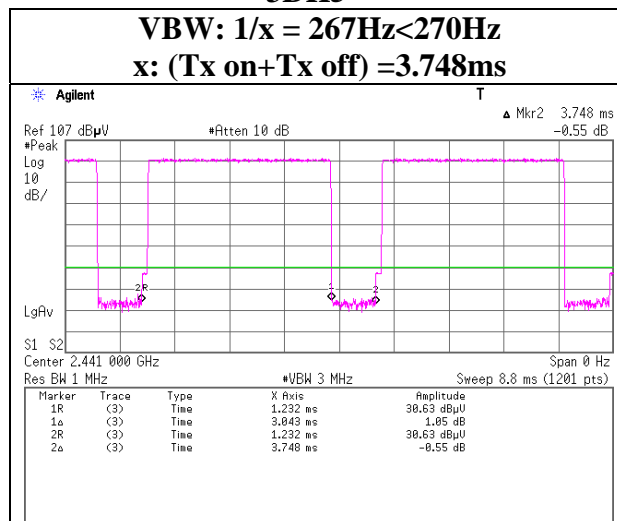
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

## VBW (AV) Calculation

### DH5



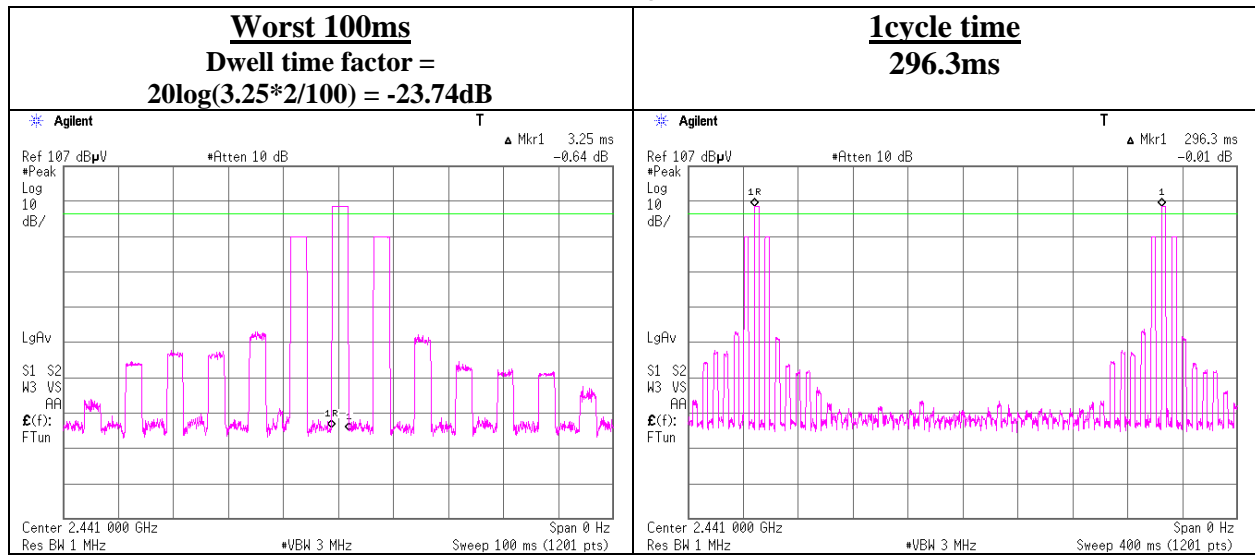
### 3DH5



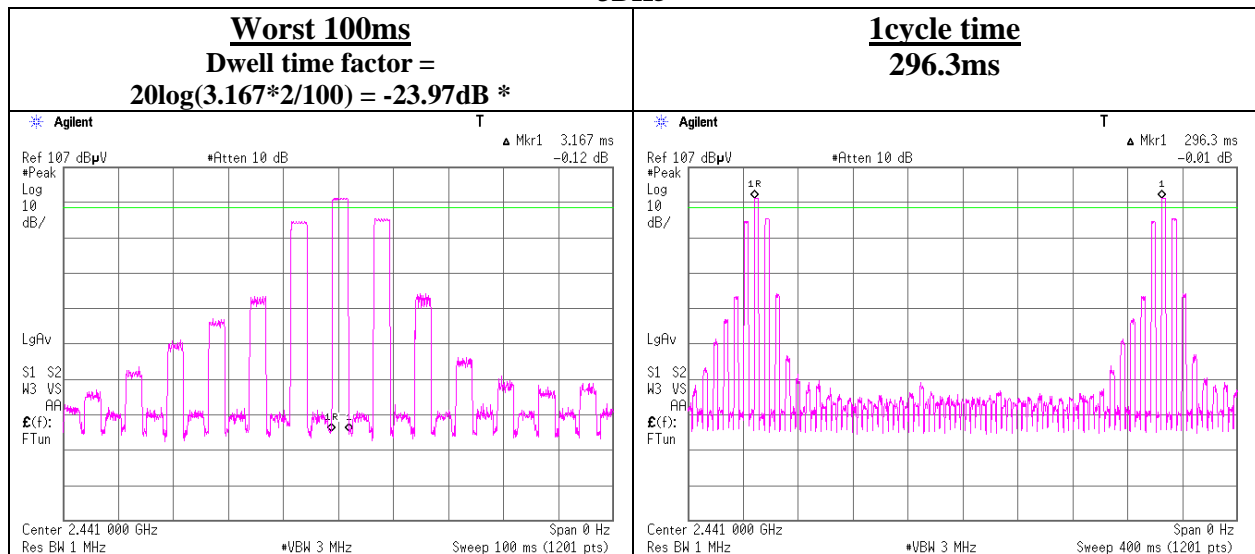
\*Although the measurement with VBW:10Hz was allowed, the test was performed with more stringent VBW:1/(Ton + Toff), which was easier than 1/Ton.

**Dwell time factor**

**DH5**



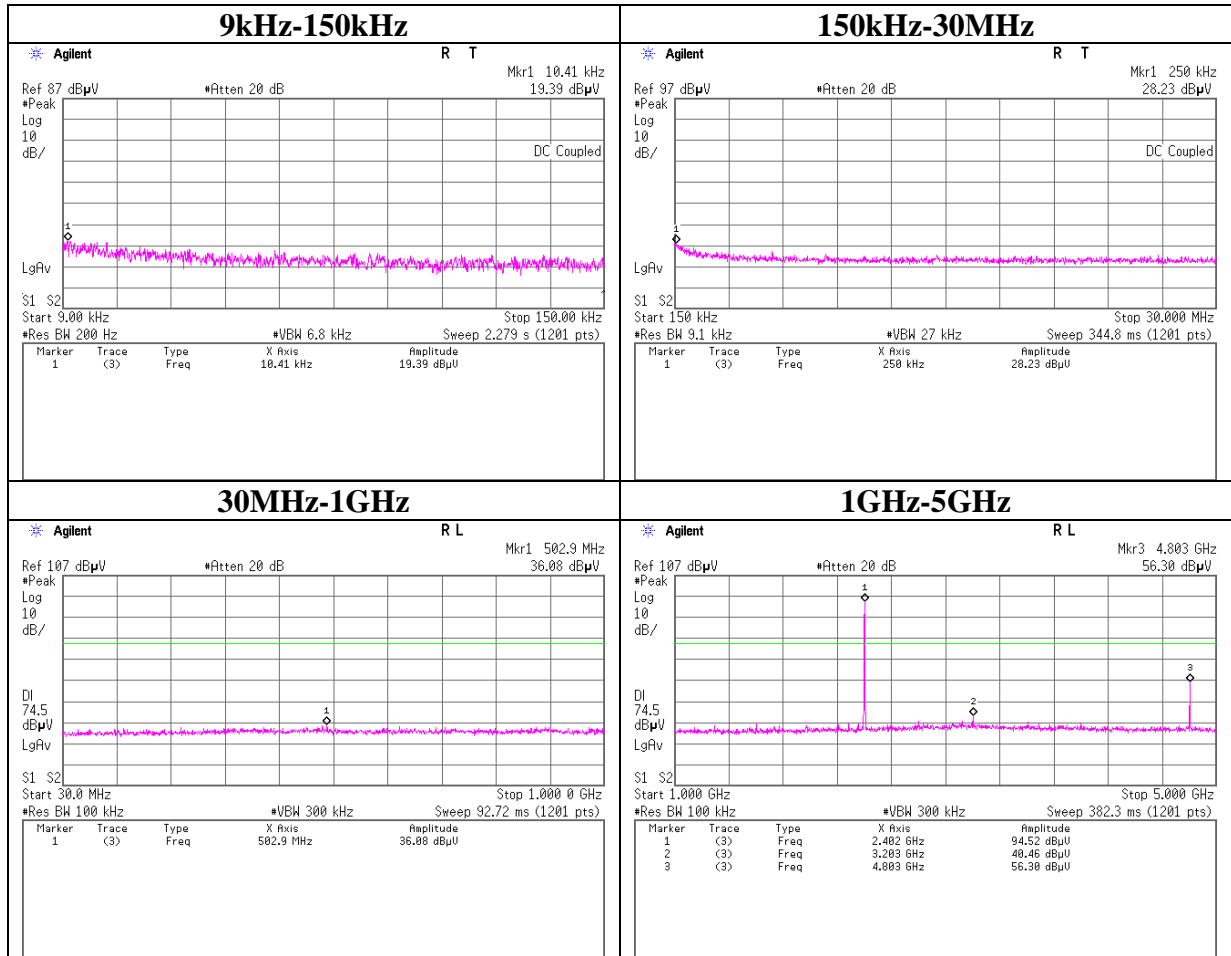
**3DH5**



\* Dwell time factor was calculated as the worst case where two hops dwells at one channel in 100ms. Theoretical value of dwell time is  $0.625\text{ms} * 5\text{slot} * 2 = 6.25\text{ms}$ , which is almost identical to the measured value.

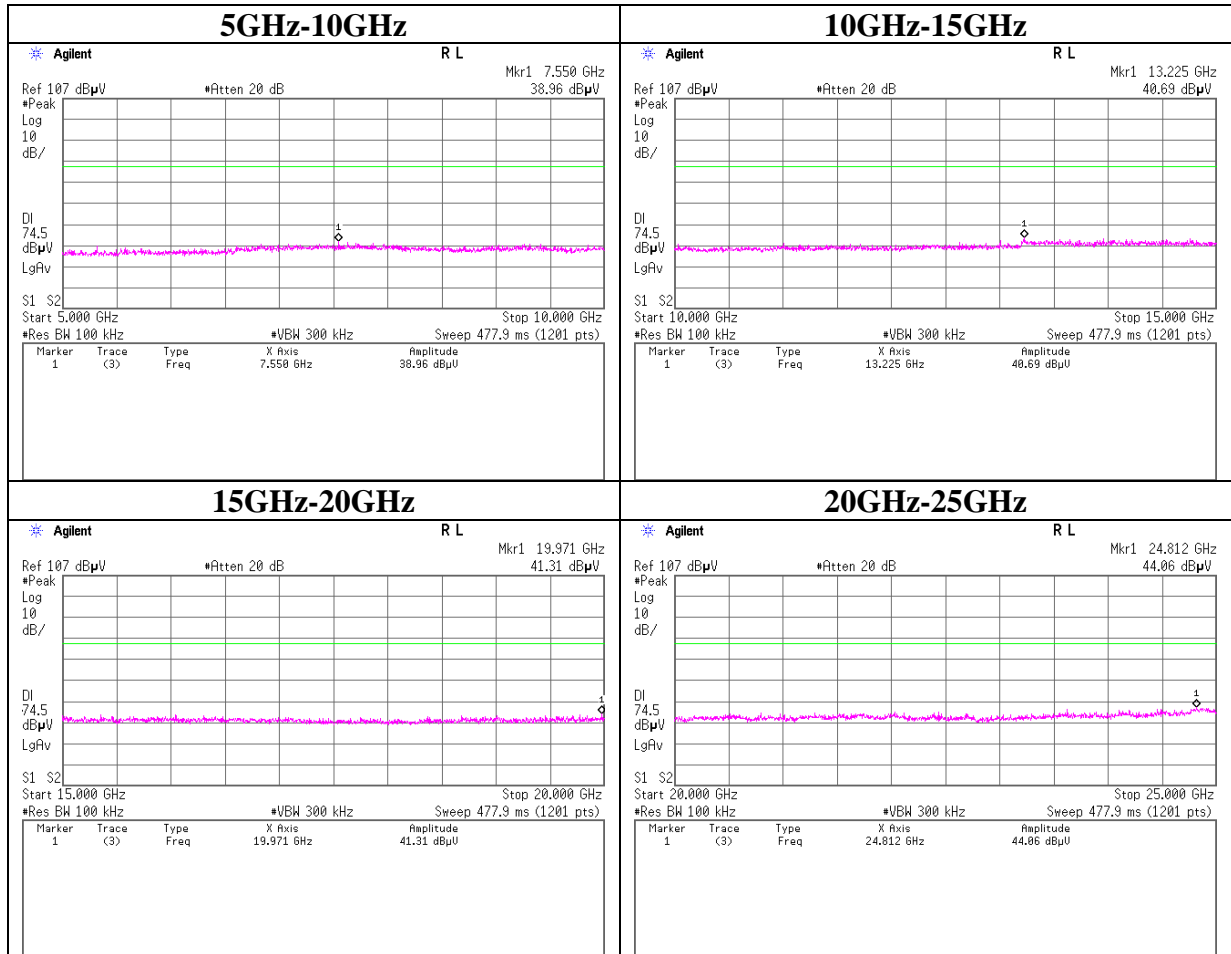
## Conducted Spurious Emission

### Tx DH5 2402MHz



## Conducted Spurious Emission

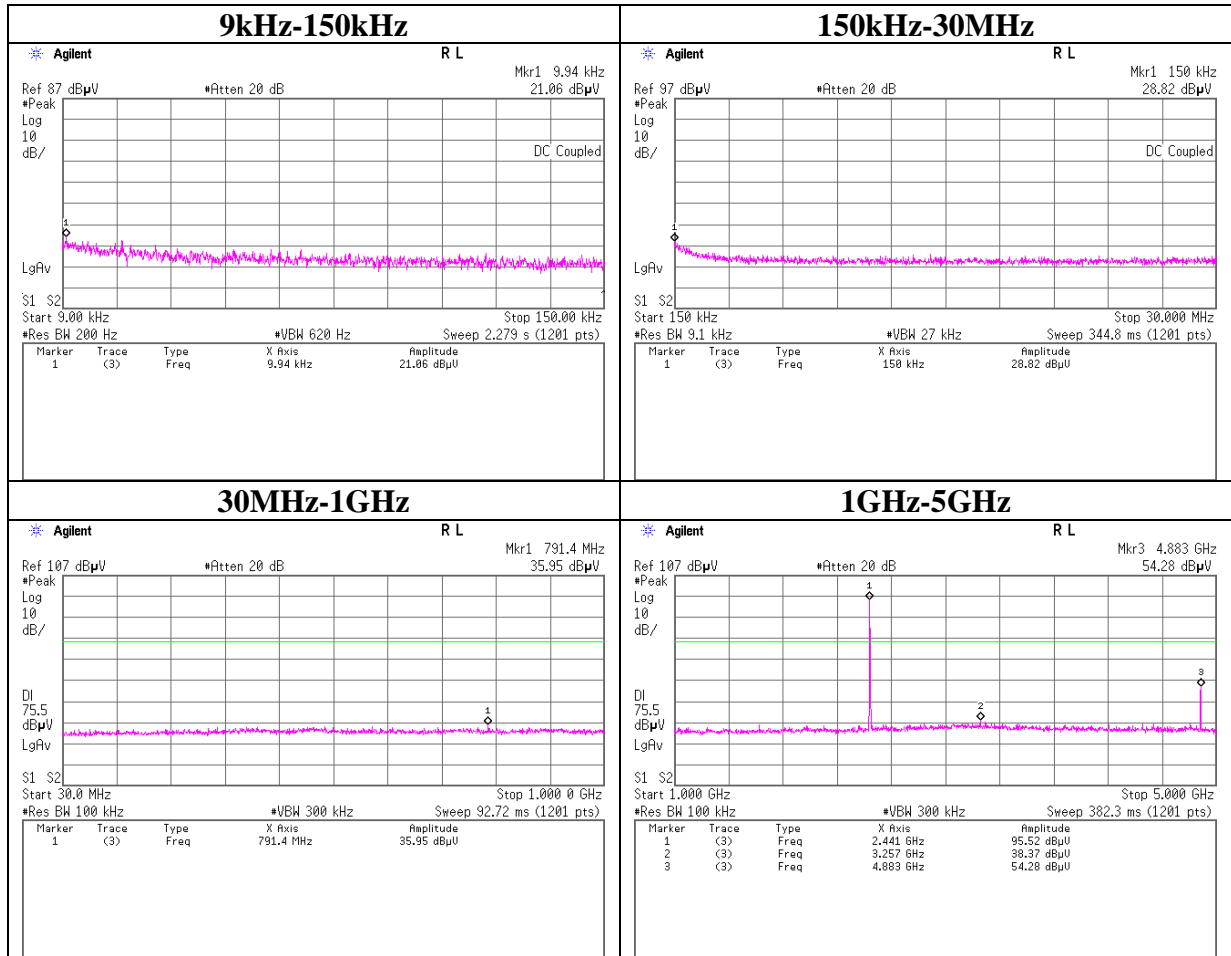
### Tx DH5 2402MHz





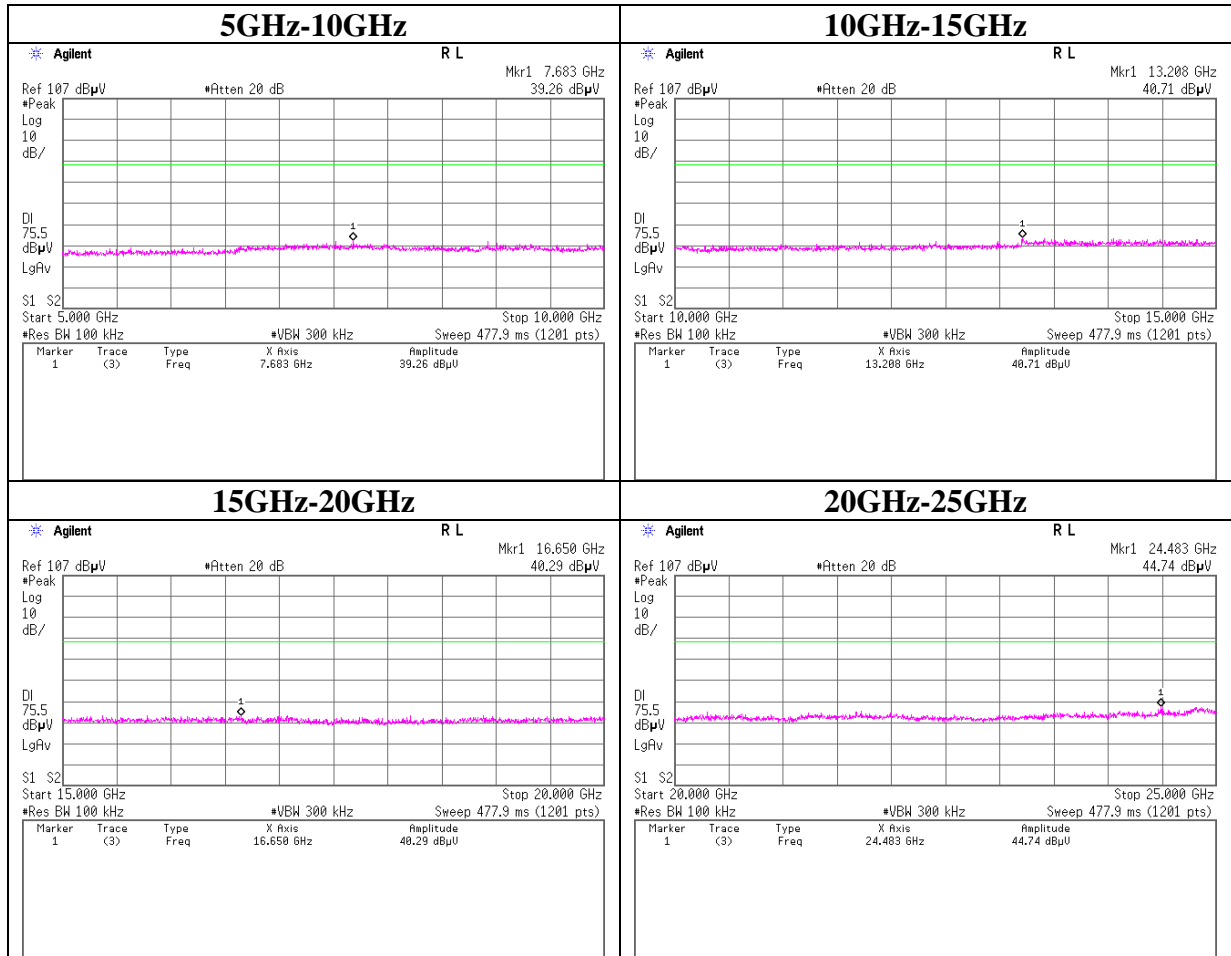
## Conducted Spurious Emission

### Tx DH5 2441MHz



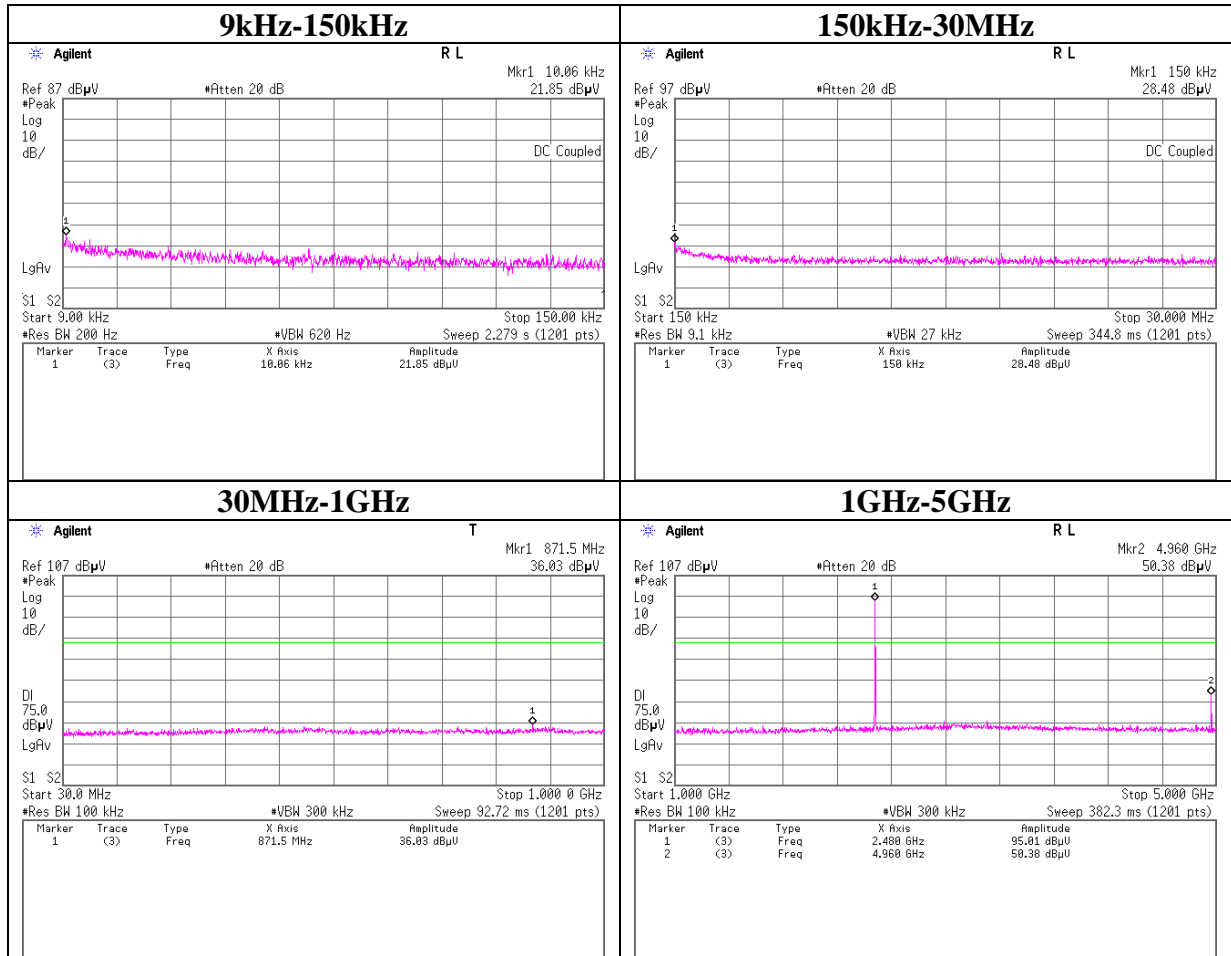
## Conducted Spurious Emission

### Tx DH5 2441MHz



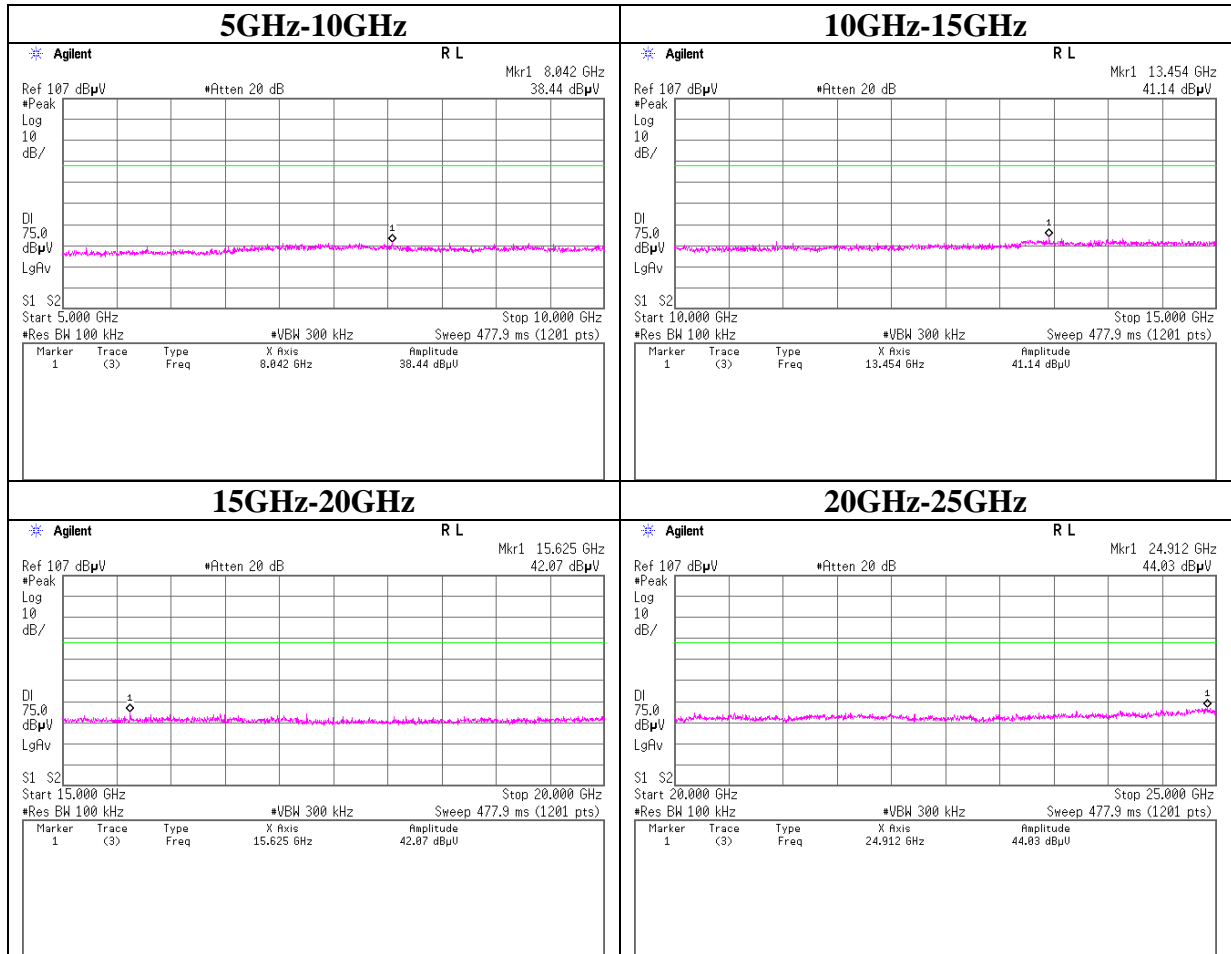
## Conducted Spurious Emission

### Tx DH5 2480MHz



## Conducted Spurious Emission

### Tx DH5 2480MHz



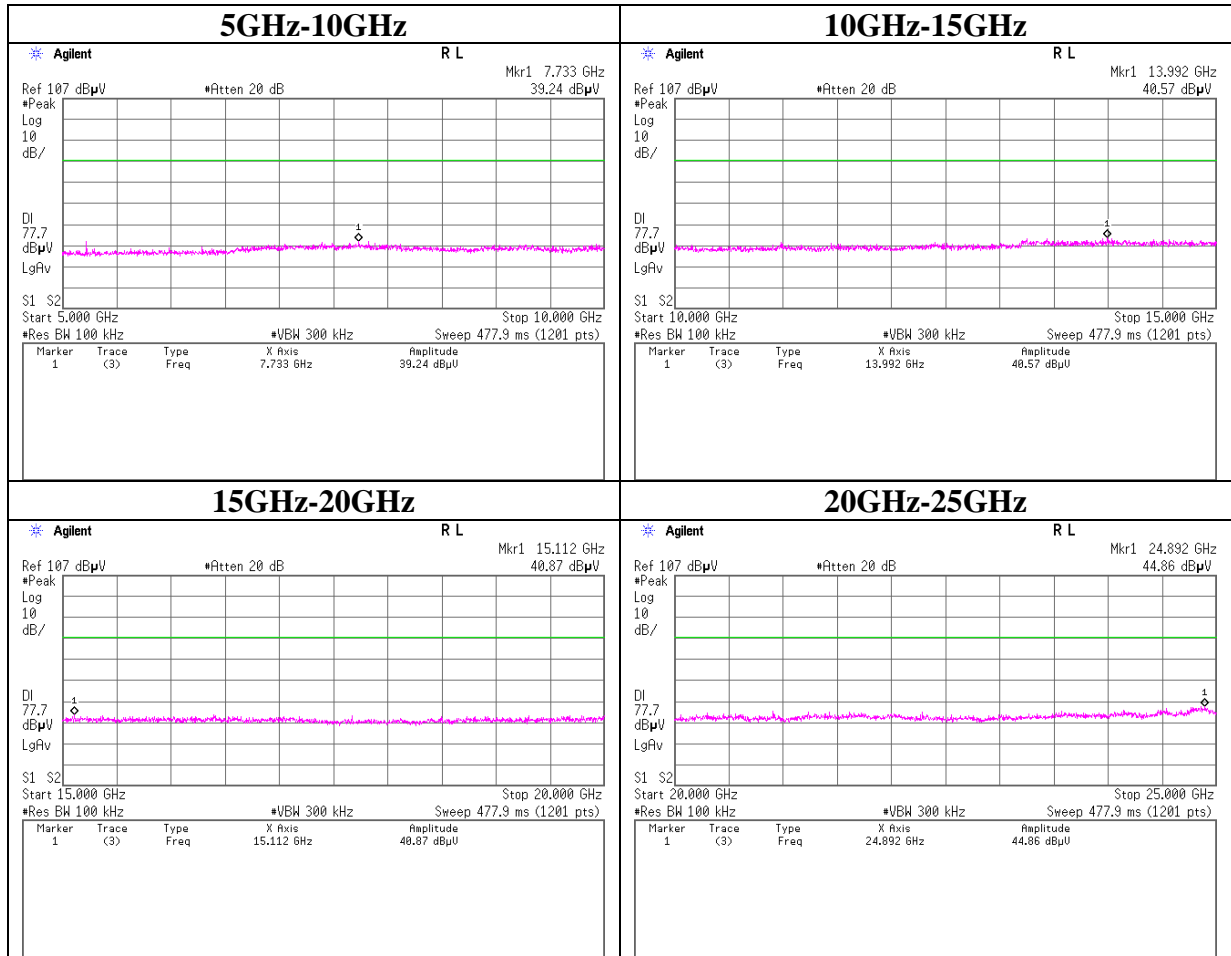
## Conducted Spurious Emission

### Tx 3DH5 2402MHz



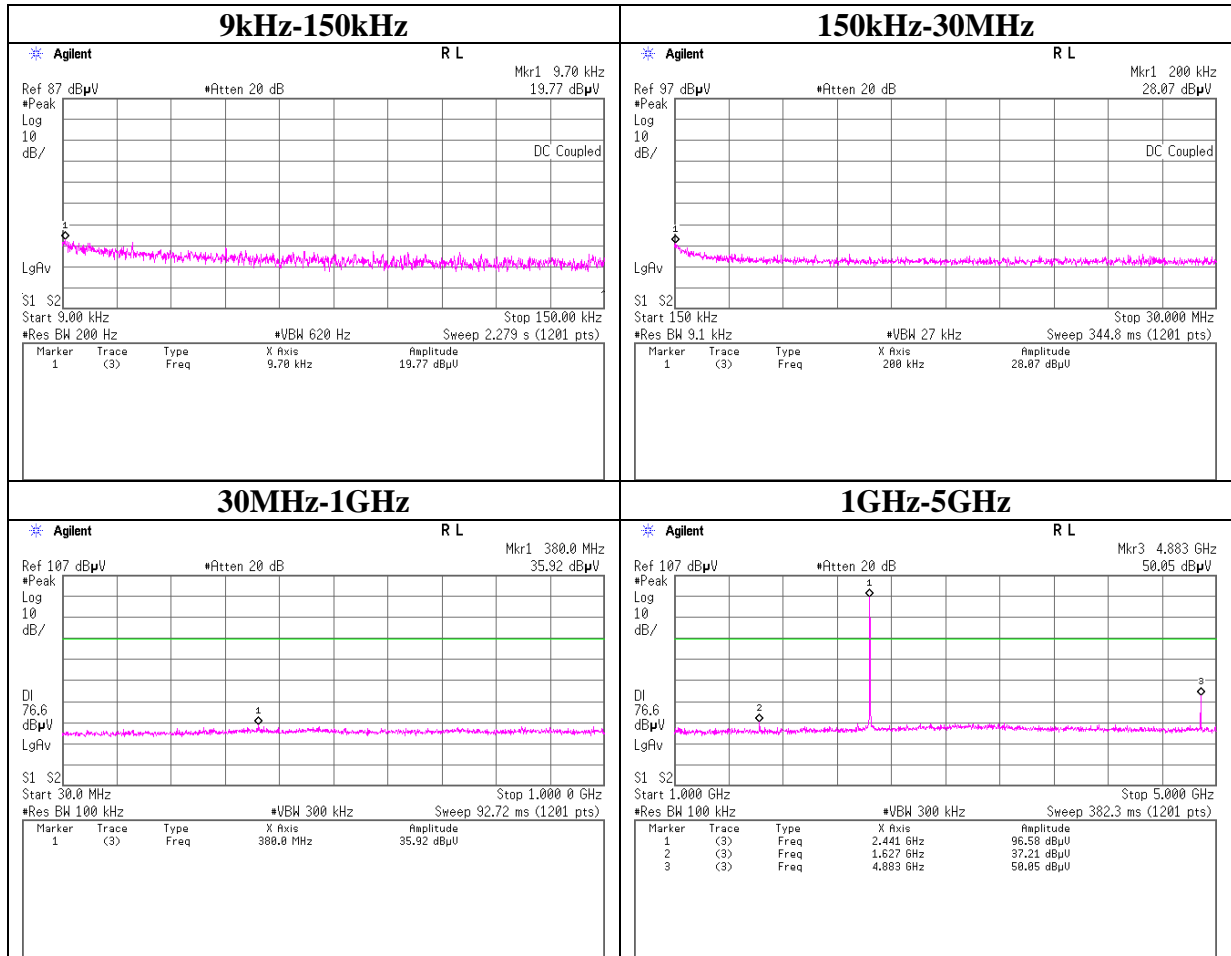
## Conducted Spurious Emission

### Tx 3DH5 2402MHz



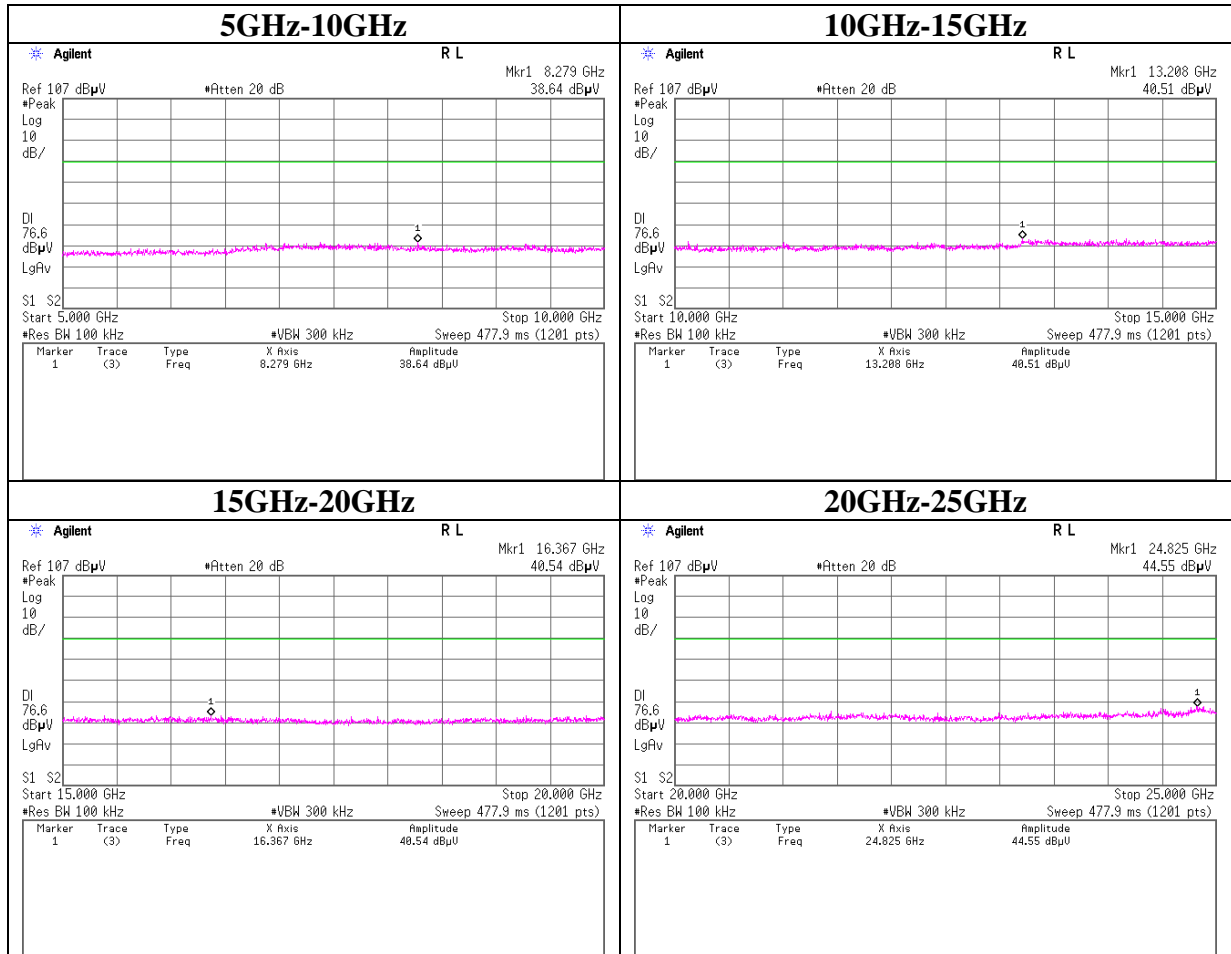
## Conducted Spurious Emission

### Tx 3DH5 2441MHz



## Conducted Spurious Emission

### Tx 3DH5 2441MHz





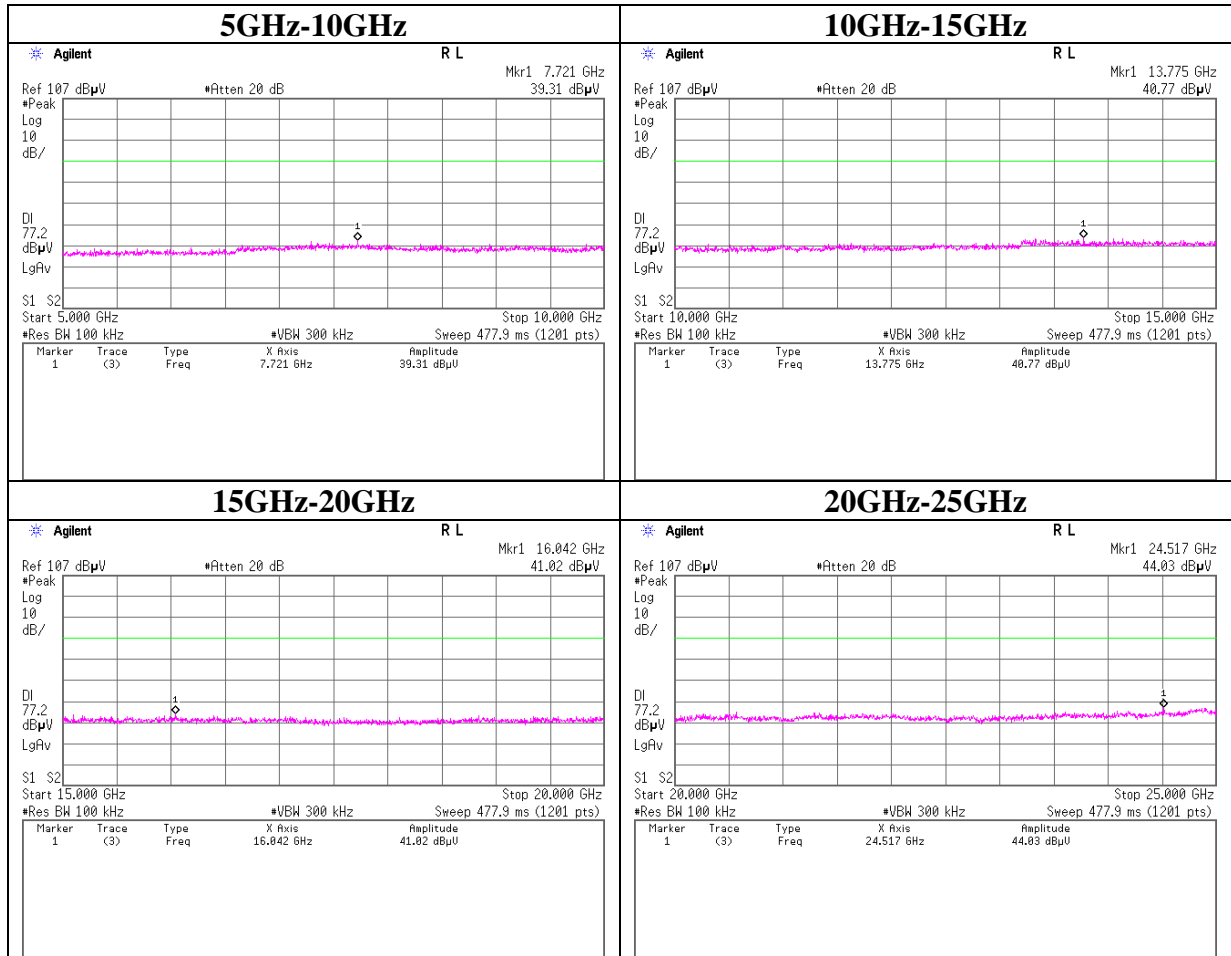
## Conducted Spurious Emission

### Tx 3DH5 2480MHz



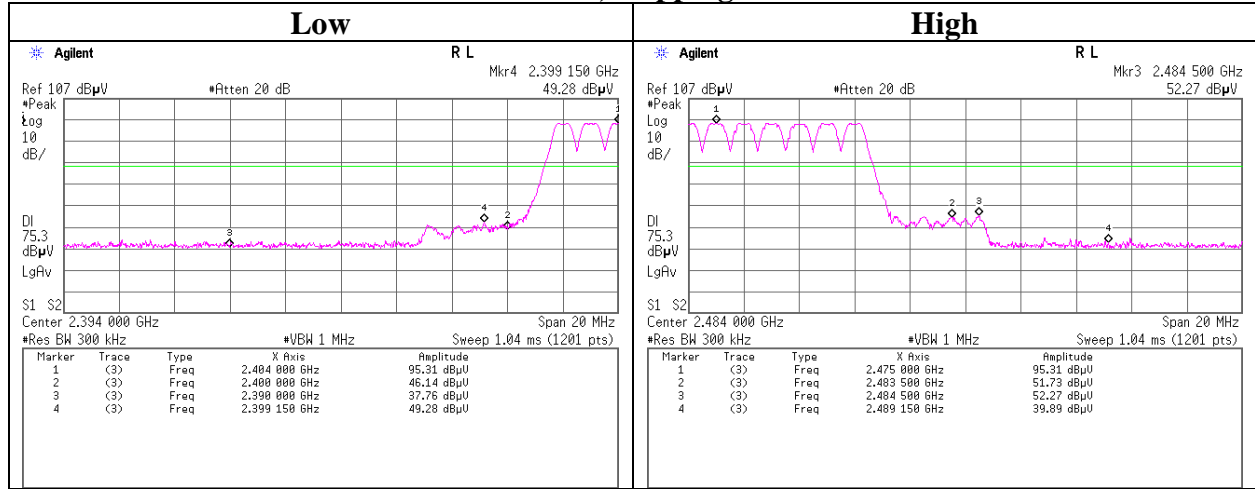
## Conducted Spurious Emission

### Tx 3DH5 2480MHz

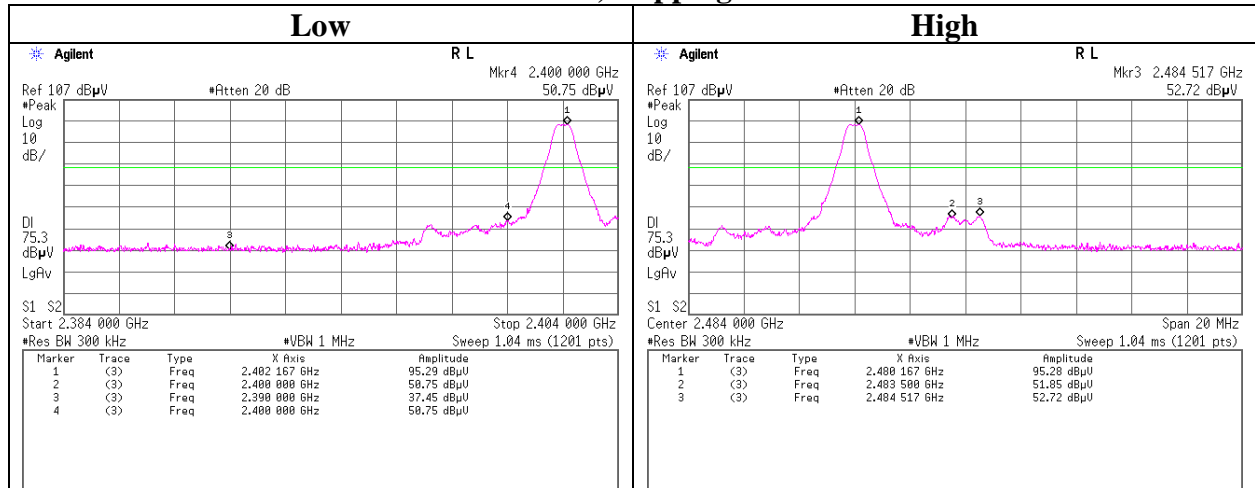


## Conducted Emission Band Edge compliance

### Tx DH5, Hopping on

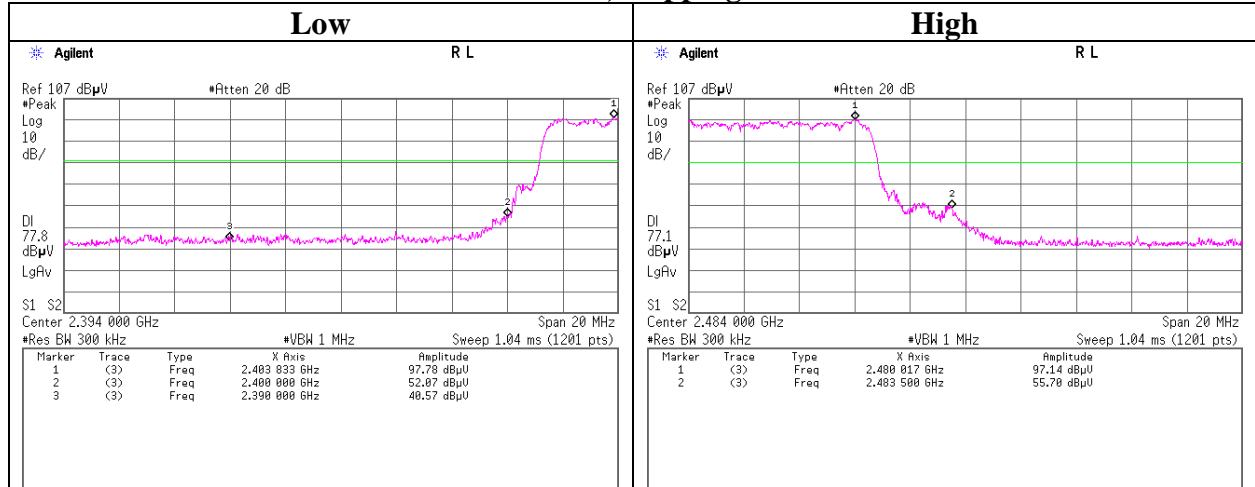


### Tx DH5, Hopping off

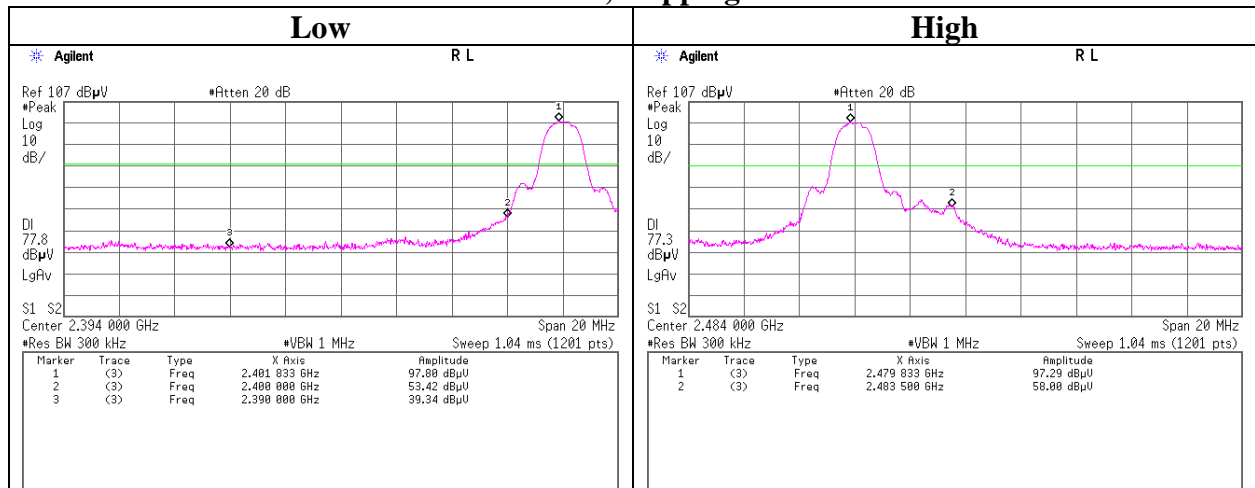


## Conducted Emission Band Edge compliance

### Tx 3DH5, Hopping on



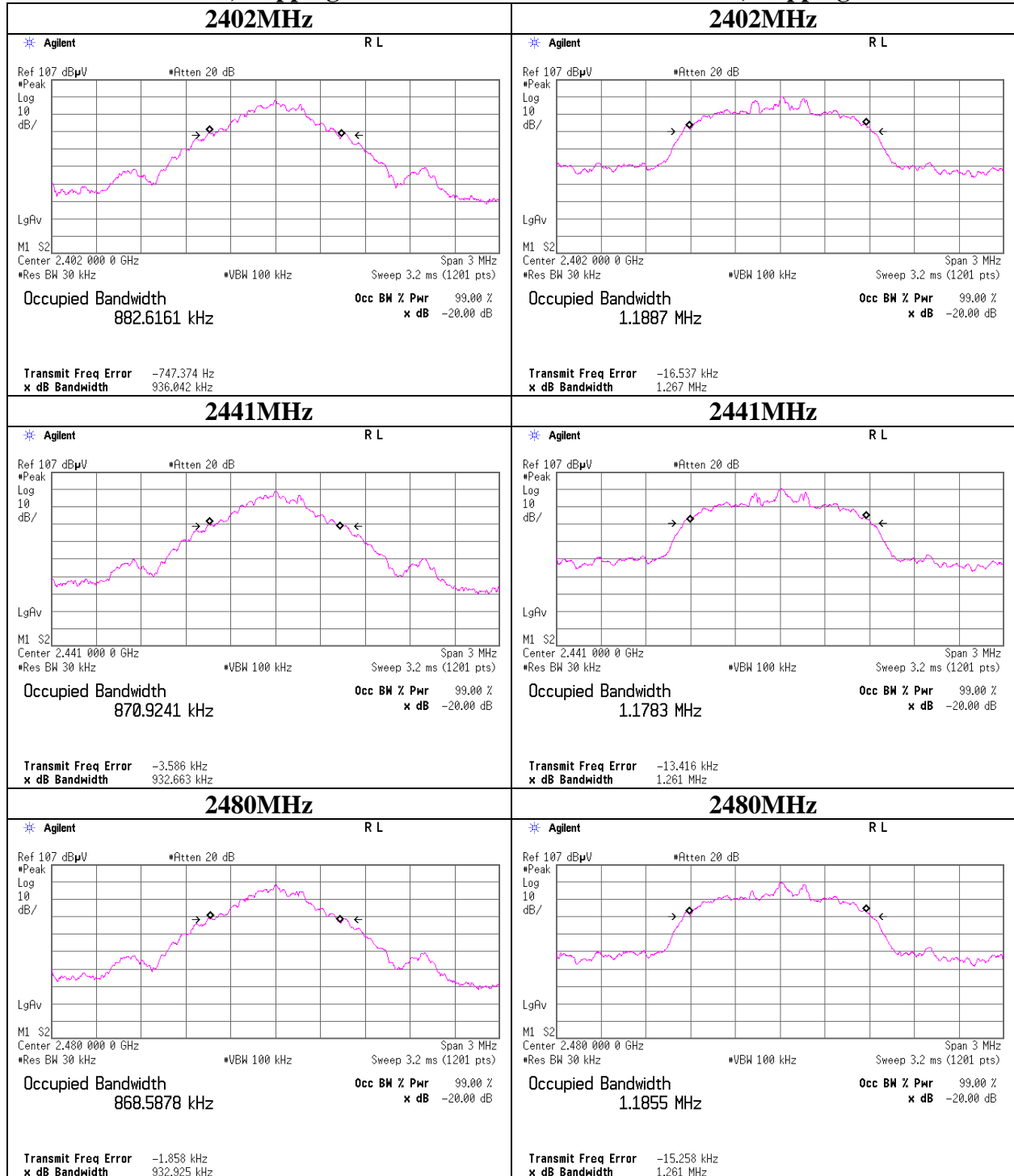
### Tx 3DH5, Hopping off



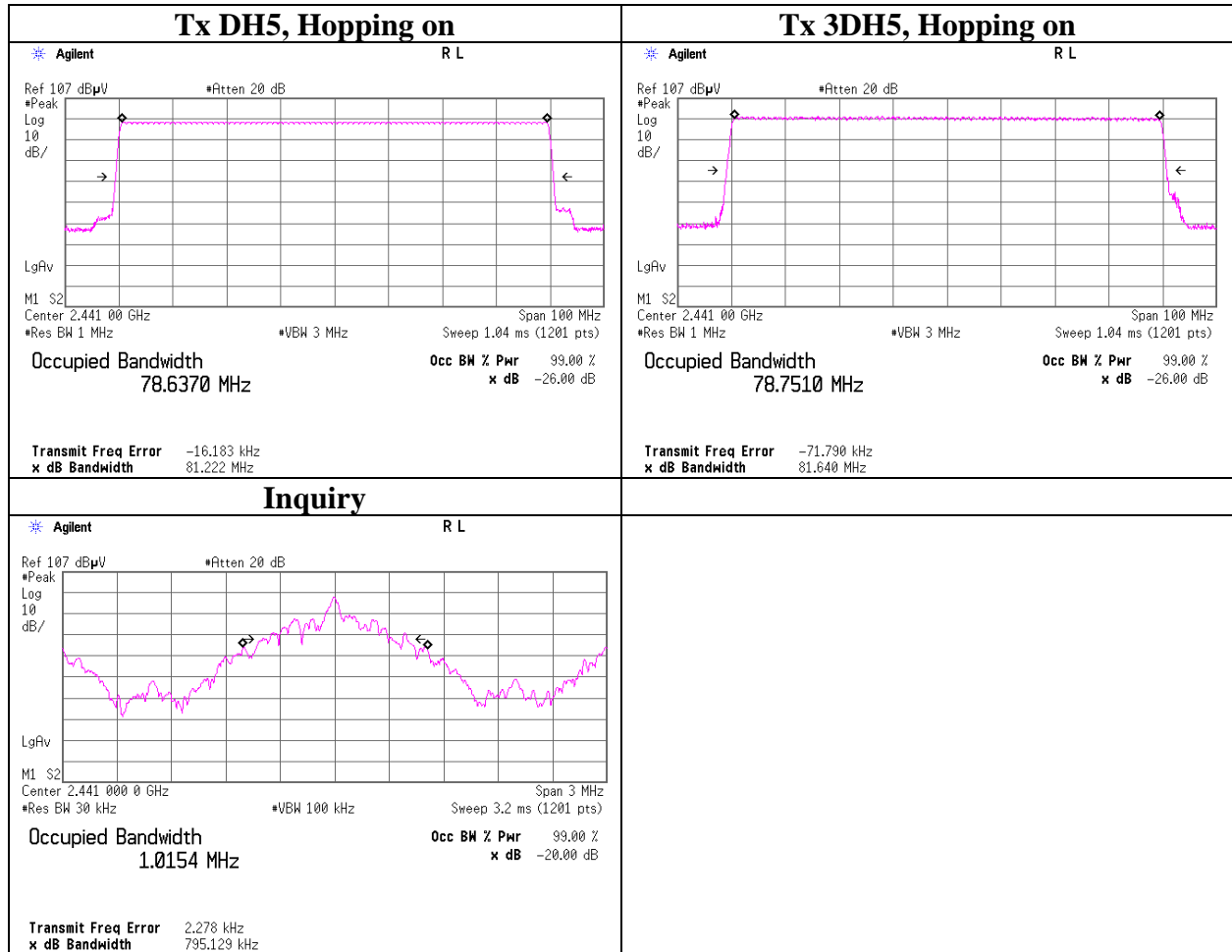
**99% Occupied Bandwidth**

**Tx DH5, Hopping off**

**Tx 3DH5, Hopping off**



### 99% Occupied Bandwidth



## APPENDIX 2: Test instruments

### EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	AT	2011/09/13 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	AT	2011/09/13 * 12
MRENT-95	Spectrum Analyzer	Agilent	E4440A	US44302652	AT/RE	2011/06/30 * 12
MCC-104	Microwave Cable	Hirose Electric	U.FL-2LP-066J1-A(200)	-	AT	2011/06/24 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2011/03/14 * 12
MOTS-MAT	Antenna terminal tests program	Matsuura Denkosha	MAC-793	1	AT	-
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	AT	2011/02/23 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2011/03/01 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2011/02/23 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2011/08/11 * 12
MCC-56	Microwave Cable	Suhner	SUCOFLEX104	270875/4(1m) / 284655(5m)	RE	2011/03/02 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2011/03/10 * 12
MHF-20	High Pass Filter 3.5-18.0GHz	TOKIMEC	TF323DCC	607	RE	2011/09/08 * 12
MCC-79	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278923/4	RE	2010/12/02 * 12
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2010/11/18 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE	2011/10/19 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2011/08/17 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2011/08/17 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2011/03/25 * 12
MAT-51	Attenuator(6dB)	Weinschel	2	AS3557	RE	2011/01/14 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2011/03/04 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2011/02/22 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE/CE	2011/02/23 * 12
MJM-06	Measure	PROMART	SEN1955	-	RE/CE	
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE/CE	2011/08/11 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2011/10/15 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2011/10/15 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2011/07/15 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2011/11/02 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2011/03/04 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2010/11/30 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(AE)	2011/02/20 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE(EUT)	2011/02/22 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2011/01/05 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/suciform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	CE	2011/07/15 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2011/02/22 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item: CE: Conducted Emission  
RE: Radiated Emission  
AT: Antenna Terminal Conducted test

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